Manual

VN1600 Interface Family

VN1610 / VN1611 / VN1630A / VN1640A

Version 2.2

English

Imprint

Vector Informatik GmbH
Ingersheimer Straße 24
D-70499 Stuttgart

The information and data given in this user manual can be changed without prior notice. No part of this manual may be reproduced in any form or by any means without the written permission of the publisher, regardless of which method or which instruments, electronic or mechanical, are used. All technical information, drafts, etc. are liable to law of copyright protection.
© Copyright 2015, Vector Informatik GmbH. All rights reserved.

Contents

1 Introduction 3

1.1 Safety Instructions and Hazard Warnings 4
1.1.1 Proper Use and Intended Purpose 4
1.1.2 Hazards 4
1.1.3 Disclaimer 4

1.2 About this User Manual 5
1.2.1 Certification 6
1.2.2 Warranty 6
1.2.3 Registered Trademarks 6

2 VN1600 Interface Family 7

2.1 Introduction 8

2.2 Accessories 8

2.3 Getting Started 9
2.3.1 Step 1: Driver Installation 9
2.3.2 Step 2: Device Installation 9
2.3.3 Step 3: Device Configuration 9
2.3.4 Step 4: Quick Test 10

2.4 VN1610 11
2.4.1 Main Features 11
2.4.2 Connectors 11
2.4.3 Pin Assignment CH1 and CH2 12
2.4.4 Technical Data 12

2.5 VN1611 13
2.5.1 Main Features 13
2.5.2 Connectors 13
2.5.3 Pin Assignment CH1 and CH2 14
2.5.4 Technical Data 15

2.6 VN1630 16
2.6.1 Main Features 16
2.6.2 Connectors Bus Side 16
2.6.3 Connectors USB Side 17
2.6.4 Bus Configuration 18
2.6.5 Pin Assignment CH1/3 and CH2/4 20
2.6.6 Pin Assignment CH5 23
2.6.7 Replacing Piggybacks 25
2.6.8 Technical Data 28

2.7 VN1630A 29
2.7.1 Main Features 29

2.8 VN1640 30
2.8.1 Main Features 30
2.8.2 Connectors Bus Side 30
2.8.3 Connectors USB Side 31
2.8.4 Bus Configuration 32
2.8.5 Pin Assignment CH1…CH4 33
2.8.6 Pin Assignment CH5 34
2.8.7 Replacing Piggybacks 36
2.8.8 Technical Data 39

2.9 VN1640A 40
2.9.1 Main Features 40

3 Common Features 41

3.1 Time Synchronization 42
3.1.1 General Information 42
3.1.2 Software Sync 44
3.1.3 Hardware Sync 45

4 Driver Installation 47

4.1 Minimum Requirements 48
4.2 Hints 49
4.3 Vector Driver Setup 50
4.4 Vector Hardware Configuration 52
4.5 Loop Tests 54
4.5.1 CAN 54
4.5.2 FlexRay 57
4.5.3 MOST 58
4.5.4 Ethernet 59

1 Introduction

In this chapter you find the following information:

1.1	Safety Instructions and Hazard Warnings Proper Use and Intended Purpose Hazards Disclaimer	page 4
1.2	About this User Manual Certification Warranty Registered Trademarks	page 5

1.1 Safety Instructions and Hazard Warnings

Caution: In order to avoid personal injuries and damage to property, you have to read and understand the following safety instructions and hazard warnings prior to installation and use of this interface. Keep this documentation (manual) always near the interface.

1.1.1 Proper Use and Intended Purpose

Caution: The interface is designed for analyzing, controlling and otherwise influencing control systems and electronic control units. This includes, inter alia, bus systems like CAN, LIN, K-Line, MOST, FlexRay, Ethernet and/or BroadR-Reach.

The interface may only be operated in a closed state. In particular, printed circuits must not be visible. The interface may only be operated (i) according to the instructions and descriptions of this manual; (ii) with the electric power supply designed for the interface, e.g. USB-powered power supply; and (iii) with accessories manufactured or approved by Vector.

The interface is exclusively designed for use by skilled personnel as its operation may result in serious personal injuries and damage to property. Therefore, only those persons may operate the interface who (i) have understood the possible effects of the actions which may be caused by the interface; (ii) are specifically trained in the handling with the interface, bus systems and the system intended to be influenced; and (iii) have sufficient experience in using the interface safely.

The knowledge necessary for the operation of the interface can be acquired in workshops and internal or external seminars offered by Vector. Additional and interface specific information, such as „Known Issues“, are available in the „Vector KnowledgeBase“ on Vector´s website at www.vector.com. Please consult the „Vector KnowledgeBase“ for updated information prior to the operation of the interface.

1.1.2 Hazards

Caution: The interface may control and/or otherwise influence the behavior of control systems and electronic control units. Serious hazards for life, body and property may arise, in particular, without limitation, by interventions in safety relevant systems (e.g. by deactivating or otherwise manipulating the engine management, steering, airbag and/or braking system) and/or if the interface is operated in public areas (e.g. public traffic, airspace). Therefore, you must always ensure that the interface is used in a safe manner. This includes, inter alia, the ability to put the system in which the interface is used into a safe state at any time (e.g. by „emergency shutdown“), in particular, without limitation, in the event of errors or hazards.

Comply with all safety standards and public regulations which are relevant for the operation of the system. Before you operate the system in public areas, it should be tested on a site which is not accessible to the public and specifically prepared for performing test drives in order to reduce hazards.

1.1.3 Disclaimer

Caution: Claims based on defects and liability claims against Vector are excluded to the extent damages or errors are caused by improper use of the interface or use not according to its intended purpose. The same applies to damages or errors arising from insufficient training or lack of experience of personnel using the interface.

1.2 About this User Manual

Conventions

In the two following charts you will find the conventions used in the user manual regarding utilized spellings and symbols.

Style	Utilization
bold	Blocks, surface elements, window- and dialog names of the software. Accentuation of warnings and advices. **[OK]** Push buttons in brackets **File|Save** Notation for menus and menu entries
Microsoft	Legally protected proper names and side notes.
`Source Code`	File name and source code.
Hyperlink	Hyperlinks and references.
<CTRL>+<S>	Notation for shortcuts.

Symbol	Utilization
	Here you can obtain supplemental information.
	This symbol calls your attention to warnings.
	Here you can find additional information.
	Here is an example that has been prepared for you.
	Step-by-step instructions provide assistance at these points.
	Instructions on editing files are found at these points.
	This symbol warns you not to edit the specified file.

1.2.1 Certification

Certified Quality Management System

Vector Informatik GmbH has ISO 9001:2008 certification. The ISO standard is a globally recognized standard.

1.2.2 Warranty

Restriction of warranty

We reserve the right to change the contents of the documentation and the software without notice. Vector Informatik GmbH assumes no liability for correct contents or damages which are resulted from the usage of the documentation. We are grateful for references to mistakes or for suggestions for improvement to be able to offer you even more efficient products in the future.

1.2.3 Registered Trademarks

Registered trademarks

All trademarks mentioned in this documentation and if necessary third party registered are absolutely subject to the conditions of each valid label right and the rights of particular registered proprietor. All trademarks, trade names or company names are or can be trademarks or registered trademarks of their particular proprietors. All rights which are not expressly allowed are reserved. If an explicit label of trademarks, which are used in this documentation, fails, should not mean that a name is free of third party rights.

> Windows, Windows 7, Windows 8.1 are trademarks of the Microsoft Corporation.

2 VN1600 Interface Family

In this chapter you find the following information:

2.1	Introduction	page 8
2.2	Accessories	page 8
2.3	Getting Started	page 9
2.4	VN1610	page 11
2.5	VN1611	page 13
2.6	VN1630	page 16
2.7	VN1630A	page 29
2.8	VN1640	page 30
2.9	VN1640A	page 40

2.1 Introduction

General information

The VN1600 interface family is an advanced development of the proven CANcaseXL, which is a flexible and cost-efficient solution for CAN, LIN, K-Line and J1708 applications. An excellent performance with minimal latency times and high time stamp accuracy is also guaranteed.

The multi-application functionality of the VN1600 interface family supports simultaneous operation of different applications on one channel, e. g. CANoe and CANape. Tasks range from simple bus analyses to complex remaining bus simulations also diagnostic, calibration and reprogramming tasks as well as LIN 2.1 compliance tests. You can also program your own applications using the XL Driver Library.

Bus types

Depending on the VN16xx interface, built-in transceivers as well as exchangeable CAN/LIN and J1708 transceivers can be used. The exchangeable transceivers are available as plug-in boards (Piggybacks) and are inserted in the VN16xx. A list of compatible Piggybacks can be found in the accessories manual on the driver CD.

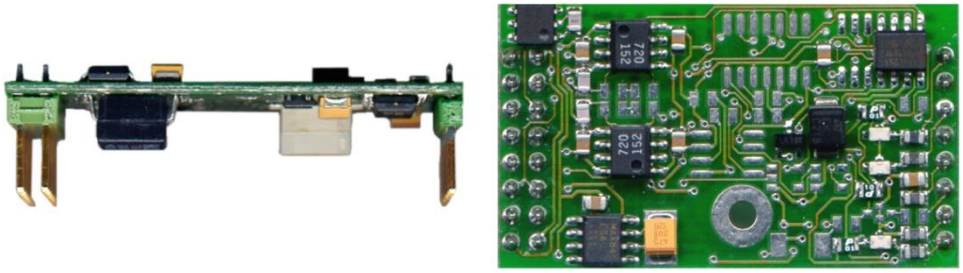


Figure 1: Piggyback

2.2 Accessories

Reference: Further information on the available accessories can be found in the separate accessories manual on the driver CD in `\Documentation\Accessories`.

2.3 Getting Started

2.3.1 Step 1: Driver Installation

Please use the drivers from the included Vector Driver Disk.

1. Execute **Vector Driver Setup** from the autostart menu or directly from `\Drivers\Setup.exe` before the VN16xx is connected to the PC via USB. If you have already connected the VN16xx, the **Windows found new Hardware** wizard appears. Close this wizard and then execute the driver setup.
2. Finish the driver installation with the setup.

Note: Further information on the driver installation can be found in the separate installation instructions at the end of this manual.

2.3.2 Step 2: Device Installation

1. Install the drivers as described before.
2. Connect the VN16xx to a free USB2.0 port via the USB cable.

2.3.3 Step 3: Device Configuration

Configuration

Before the installed device can be used in an application (e. g. CANalyzer, CANoe), it has to be properly configured for the needed use case.

This configuration is done with the **Vector Hardware Config** tool which comes with the driver installation. The tool can be found in: **Windows | Start | Settings | Control Panel | Vector Hardware** and manages all installed Vector devices.

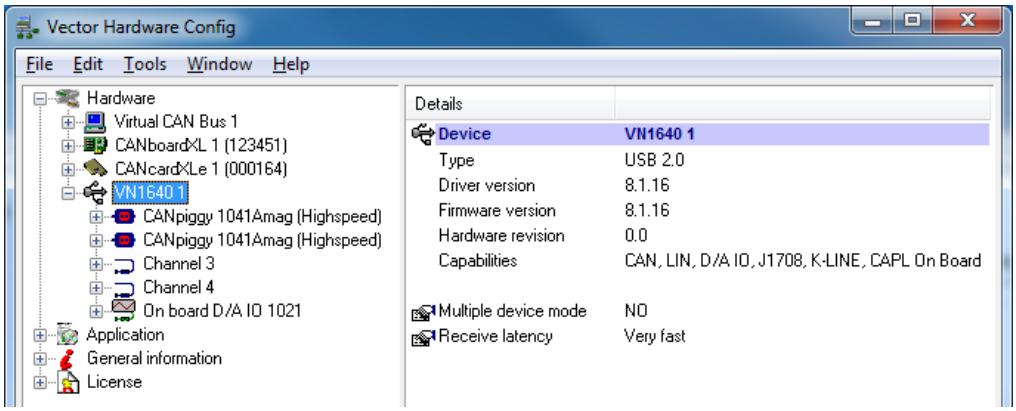


Figure 2: Vector Hardware Config

For the quick test described in this manual no further configuration is required.

Note: Further details on the **Vector Hardware Config** tool can be found in the separate installation instructions at the end of this manual.

2.3.4 Step 4: Quick Test

Note: Please execute the test described in section Loop Tests on page 54.

2.4 VN1610

2.4.1 Main Features

VN1610 features

The main features of the VN1610 interface are:

- 2x CAN high-speed 1051cap transceivers (capacitively decoupled)
- Software sync

Figure 3: VN1610 CAN Interface

2.4.2 Connectors

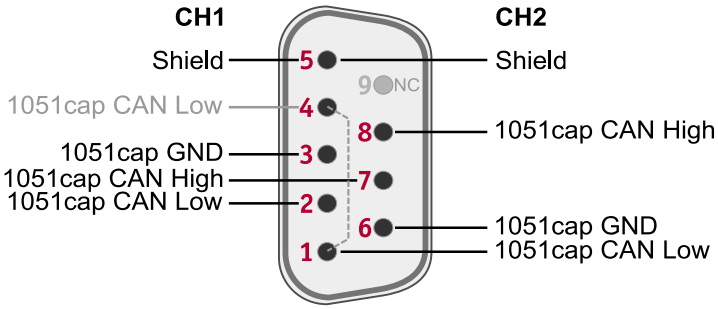
- **D-SUB9 (CH1/2)**
  The VN1610 has a D-SUB9 connector with two CAN channels. Further information on the pin assignment for CH1/CH2 can be found in section Pin Assignment CH1 and CH2 on page 12.
- **USB**
  Connect your PC and the VN1610 via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer).

2.4.3 Pin Assignment CH1 and CH2

D-SUB9 connector

The pin assignment of the D-SUB9 connector (CH1 and CH2) is as follows:

CH1/CH2



CAN Y cable

Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, article number 05075).

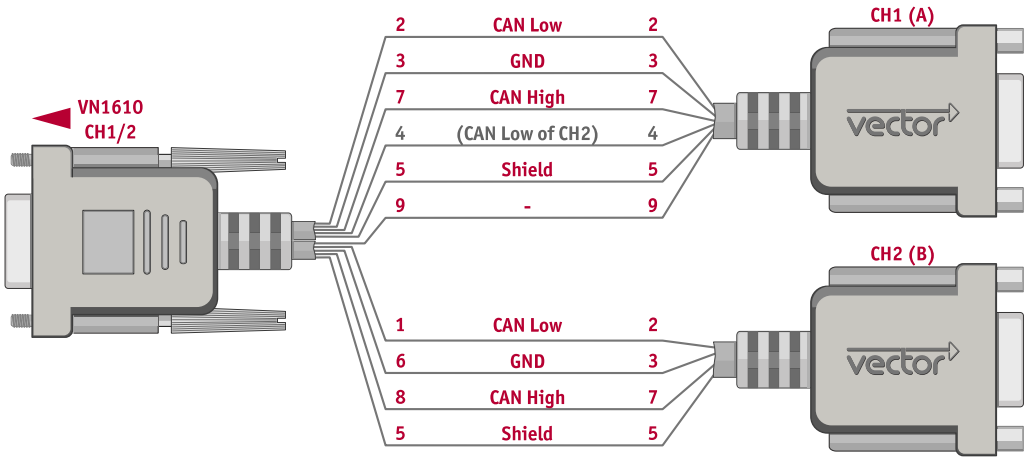


Figure 4: CANcable 2Y connected to VN1610

2.4.4 Technical Data

CAN channels	2x CAN high-speed 1051cap, up to 2 Mbit/s
Temperature range	Operating: -40 °C...+70 °C Shipping and storage: -40 °C...+85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Operating system requirements	Windows 7 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit)
Dimensions (LxWxH)	65 mm x 42 mm x 20 mm
Weight	80 g

2.5 VN1611

2.5.1 Main Features

VN1611 features

The main features of the VN1611 interface are:

- 1x LIN 7269cap transceiver (capacitively decoupled)
- 1x CAN high-speed 1051cap transceiver (capacitively decoupled)
- Software sync

Figure 5: VN1611 LIN/CAN Interface

Note: The VN1611 does not support LIN2.1 compliance tests. Please use the VN1630 or the VN1640 for these purposes.

2.5.2 Connectors

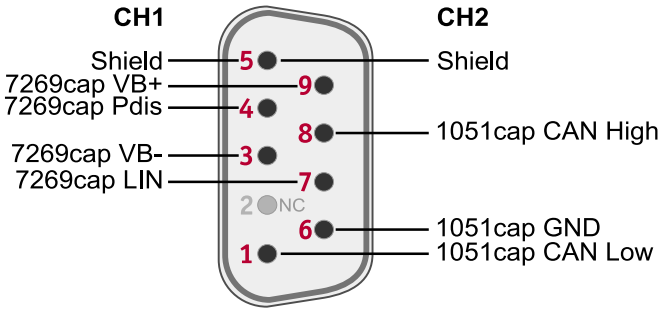
- **D-SUB9 (CH1/2)**
  The VN1611 has a D-SUB9 connector with one LIN and one CAN channel. Further information on the pin assignment for CH1/CH2 can be found in section Pin Assignment CH1 and CH2 on page 14
- **USB**
  Connect your PC and the VN1611 via USB to install and to use the device with measurement applications (e. g. CANoe, CANalyzer).

2.5.3 Pin Assignment CH1 and CH2

D-SUB9 connector

The pin assignment of the D-SUB9 connector (CH1 and CH2) is as follows:

CH1/CH2



Pdis: power disable

CAN/LIN Y cable

Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, article number 05075).

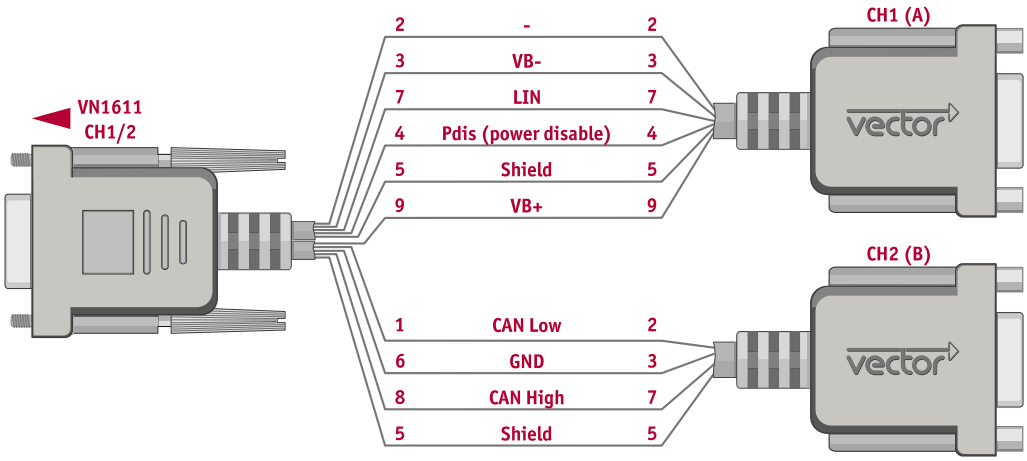


Figure 6: CANcable 2Y connected to VN1611

Note: If pin 4 (Pdis) is connected to pin 3 (VB-), the internal power supply is disabled. In this case an external power supply is required at pin 9 (VB+).

2.5.4 Technical Data

CAN channels	1x CAN high-speed 1051cap, up to 2 Mbit/s
LIN channels	1x LIN 7269cap, up to 330 kbit/s
K-Line channels	1
Temperature range	Operating: -40 °C...+70 °C Shipping and storage: -40 °C...+85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Operating system requirements	Windows 7 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit)
Dimensions (LxWxH)	65 mm x 42 mm x 20 mm
Weight	80 g

2.6 VN1630

2.6.1 Main Features

VN1630 features

The main features of the VN1630 interface are:

- 2x CAN high-speed 1051cap transceivers (capacitively decoupled)
- 2x additional plug-in locations for CAN-/LINpiggies
- Fifth channel for dedicated digital-analog input/output tasks
- Software sync
- Hardware sync (via SYNCcableXL)

Figure 7: VN1630 CAN/LIN Interface

2.6.2 Connectors Bus Side

Device connectors

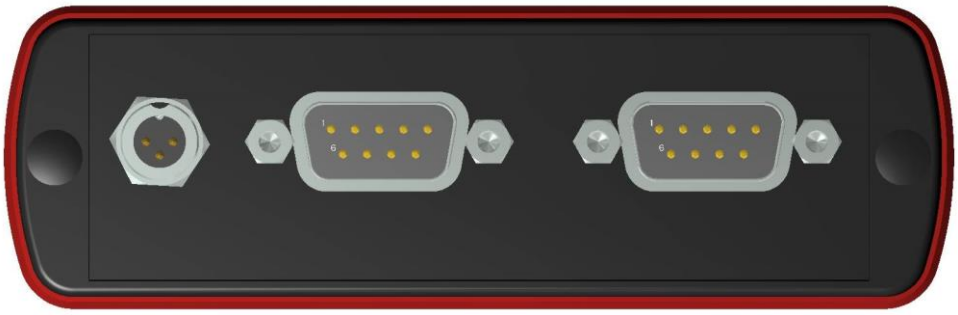


Figure 8: VN1630 with 1x Sync and 2x D-SUB9

- **Binder connector (Sync)**
  This connector (Binder type 711) can be used for time synchronization of different Vector devices. **The sync connector is not intended to connect a power supply.**

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground

> **D-SUB9 (CH1/3 and CH2/4)**
The VN1630 has two D-SUB9 connectors, each with up to two channels (CAN/CAN or LIN/CAN). Further information on the pin assignment for CH1/CH3 and CH2/CH4 can be found in section Pin Assignment CH1/3 and CH2/4 on page 20.

2.6.3 Connectors USB Side

Device connectors

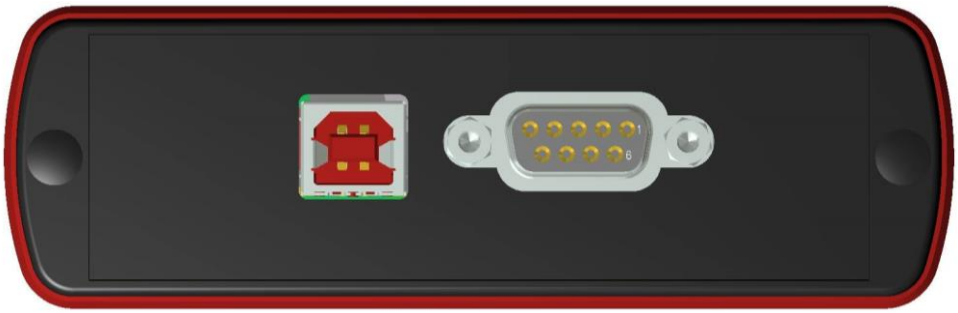


Figure 9: VN1630 with 1x USB and 1x D-SUB9

> **USB**
Connect your PC and the VN1630 via USB to install and to use the device with measurement applications (CANoe, CANalyzer). Use the USB2.0 compliant cable found in the delivery (USB extension cables may generate faults between the PC and the device). Connect the device directly to USB at your PC or use a USB hub with its own power supply (self-powered). Depending on the used Piggyback, the VN1630 requires the entire USB current (500 mA) which cannot be provided by a bus-powered USB hub.

> **D-SUB9 (CH5)**
The VN1630 has a D-SUB9 connector (CH5) for dedicated digital-analog input/output tasks. The pin assignment can be found in section Pin Assignment CH5 on page 23.

2.6.4 Bus Configuration

Piggybacks for CH1 and CH2

An advantage of the VN1630 is its two Piggyback plug-in locations (primary channels CH1 and CH2). Depending on requirements, **electrically** decoupled CAN High-Speed, CAN Low-Speed, CAN Single Wire, J1708 or LIN transceivers may be used. In addition, two electrically decoupled built-in CAN TJA1051 (high-speed) transceivers are available (secondary channels CH3 and CH4). CH5 is reserved for dedicated IO tasks.

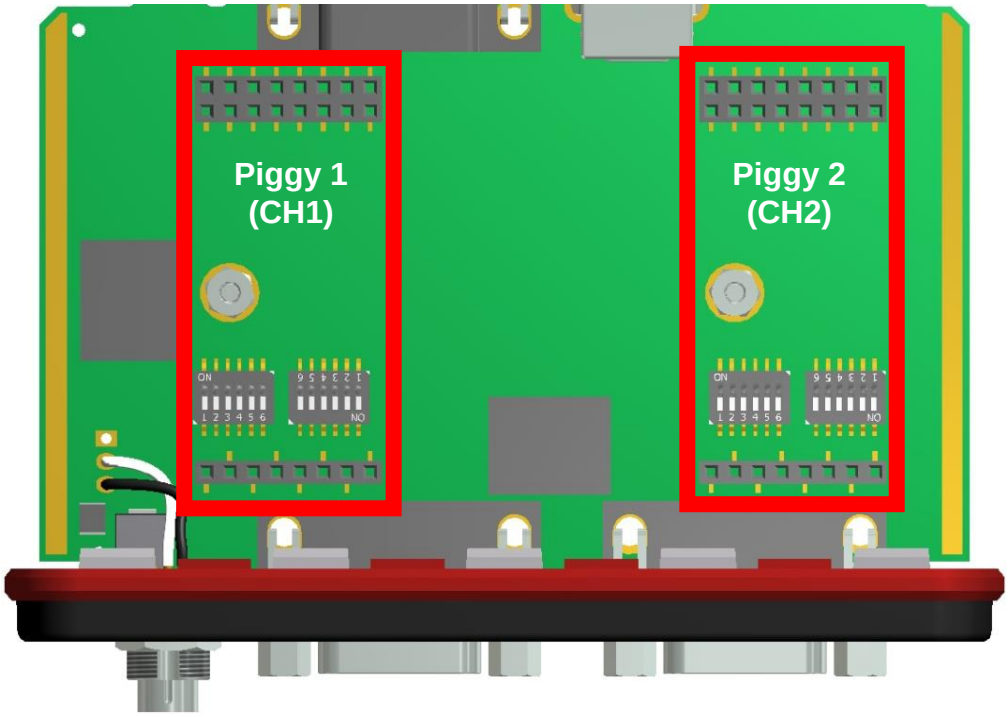


Figure 10: Piggyback plug-in locations for CH1 and CH2

Note: LINpiggies have to be inserted before CANpiggies (in ascending order). If you intend to use only one LINpiggy, please use the first plug-in location (CH 1). J1708 should be handled like CAN here.

Each empty plug-in location is loaded with a built-in transceiver from the secondary channel according to the DIP switch settings.

Reference: Further information on DIP switches can be found on page 20.

Primary	CH1	CH2	CH5
Piggyback	LIN → or ← CAN	or	IO
Secondary	**CH3**	**CH4**	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	

Examples

The following tables show examples of possible configurations:

2x CAN without Piggybacks

	CH1/CH3	CH2/CH4	CH5
Primary	**CH1**	**CH2**	**CH5**
Piggyback			-
Secondary	CH3	CH4	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	

Configuration

CH1: no Piggyback, built-in CAN 1051cap transceiver (CH3).
CH3: not usable.

CH2: no Piggyback, built-in CAN 1051cap transceiver (CH4).
CH4: not usable.

CH5: no Piggyback.

4x CAN 1x IO

	CH1/CH3	CH2/CH4	CH5
Primary	**CH1**	**CH2**	**CH5**
Piggyback	CAN	CAN	IO
Secondary	**CH3**	**CH4**	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	

Configuration

CH1: CANpiggy.
CH3: built-in CAN 1051cap transceiver.

CH2: CANpiggy.
CH4: built-in CAN 1051cap transceiver.

CH5: IOpiggy.

1x LIN 2x CAN 1x IO

	CH1/CH3	CH2/CH4	CH5
Primary	**CH1**	**CH2**	**CH5**
Piggyback	LIN		IO
Secondary	**CH3**	CH4	
Built-in Transceiver	CAN 1051cap	CAN 1051cap	

Configuration

CH1: LINpiggy.
CH3: built-in CAN 1051cap transceiver

CH2: no Piggyback, built-in CAN 1051cap transceiver (CH4).
CH4: not usable.

CH5: IOpiggy.

2.6.5 Pin Assignment CH1/3 and CH2/4

Double assignment of D-SUB9 connectors CH1 and CH2

Before installing a Piggyback in the plug-in location (see section Replacing Piggybacks on page 25), the pin assignment of the D-SUB9 connector (CH1/CH3 and CH2/CH4) has to be selected via DIP switches, which can be found inside the device at the plug-in locations.

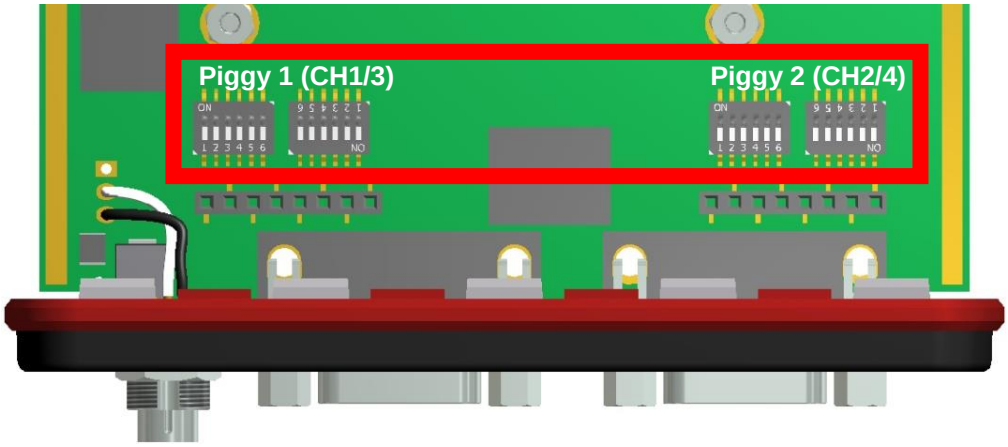


Figure 11: DIP switches (left: CH1/3, right: CH2/4)

Pin assignment CH1 … CH4

The pin assignments of the D-SUB9 connectors depend on the used bus transceiver configuration inside the VN1630. A list of available Piggybacks and their D-SUB9 pin assignments is included in the separate accessories manual.

> **No Piggyback inserted**
> If no Piggyback is inserted, only the built-in CAN transceiver at CH1 (CH2) is active (no double assignment of the D-SUB9 connector):
>
> (1) -
> (2) 1051cap CAN Low
> (3) 1051cap GND
> (4) -
> (5) Shield
> (6) -
> (7) 1051cap CAN High
> (8) -
> (9) -

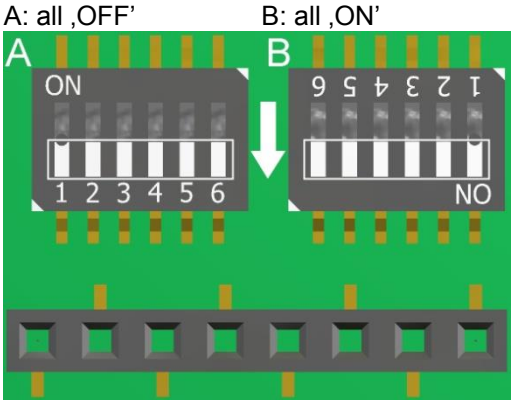
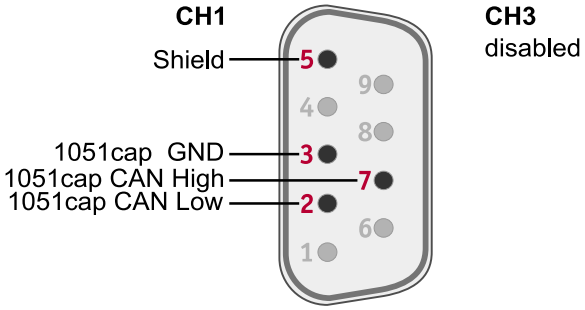


Figure 12: Configuration without Piggyback

Example: No Piggyback

The following example shows the pin assignment of CH1/CH3 if no Piggyback is inserted in the plug-in location at channel 1.



> **CAN/LIN Piggyback inserted**
> If a CAN- or LINpiggy is inserted, the Piggyback is assigned to CH1 (CH2) and the built-in CAN transceiver is assigned to CH3 (CH4):
>
> (1) 1051cap CAN Low
> (2) Piggyback-dependent
> (3) Piggyback-dependent
> (4) Piggyback-dependent
> (5) Shield
> (6) 1051cap GND
> (7) Piggyback-dependent
> (8) 1051cap CAN High
> (9) Piggyback-dependent

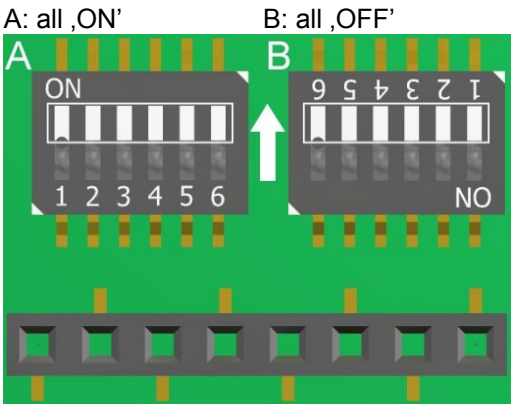
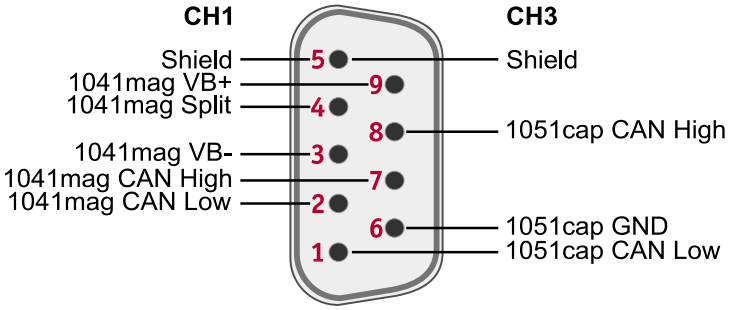


Figure 13: Configuration with Piggyback

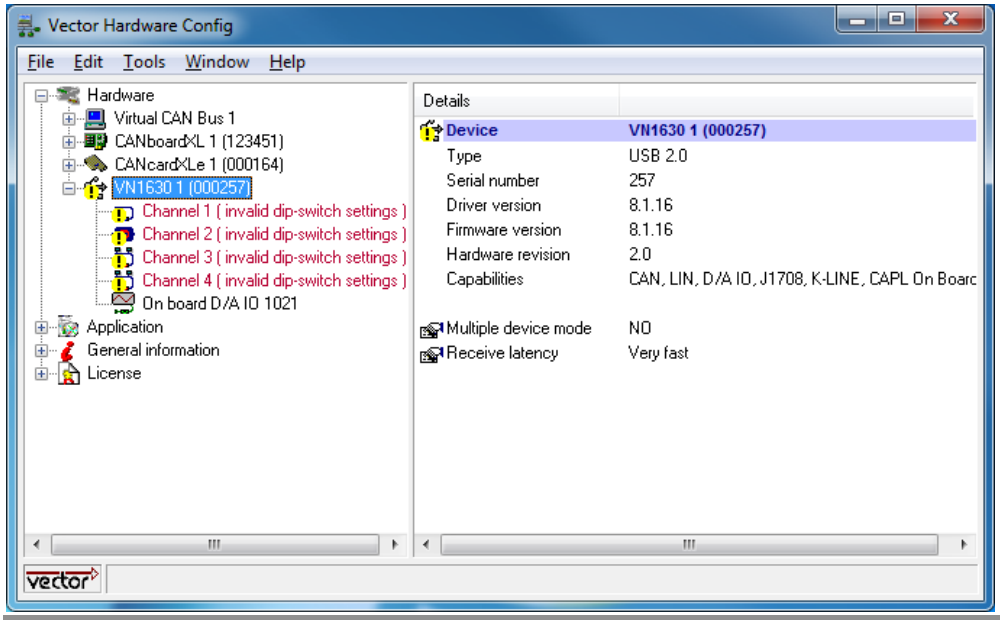
Example: CANpiggy 1041mag

The following example shows the pin assignment of CH1/CH3 if a CANpiggy 1041mag is inserted in the plug-in location at channel 1.



Note: The described pin assignment is also valid for CH2/CH4.

A warning message appears in the **Vector Hardware Config** tool if the DIP switch settings are improperly set. Check your DIP switch settings in this case.



CAN/LIN Y cable

Use the CANcable 2Y to access both channels on separate D-SUB9 connectors (see accessories manual, article number 05075). The pin assignments of the D-SUB9 connectors depend on the used bus transceiver configuration inside the VN1630. A list of available Piggybacks and their D-SUB9 pin assignments is included in the accessories manual.

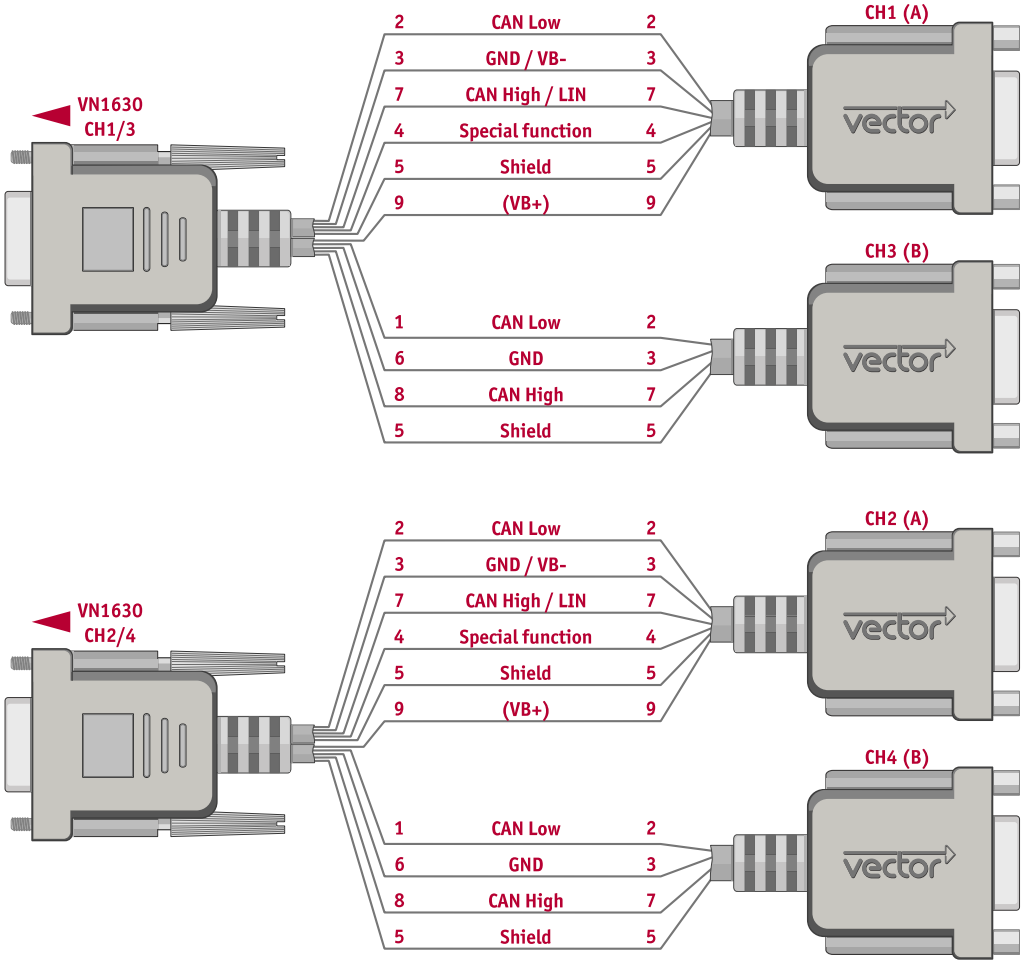


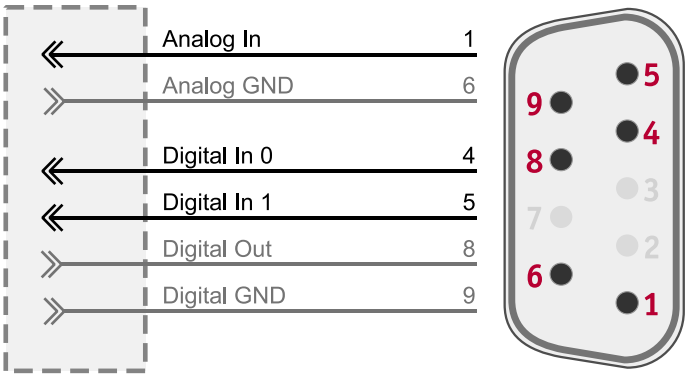
Figure 14: 2x CANcable 2Y connected to VN1630

2.6.6 Pin Assignment CH5

Digital/analog IO

The pin assignment for CH5 is as follows:

(1) Analog input
(2) Not connected
(3) Not connected
(4) Digital input 0
(5) Digital input 1
(6) Analog GND
(7) Not connected
(8) Digital output
(9) Digital GND



Internal interconnection of digital input 0/1

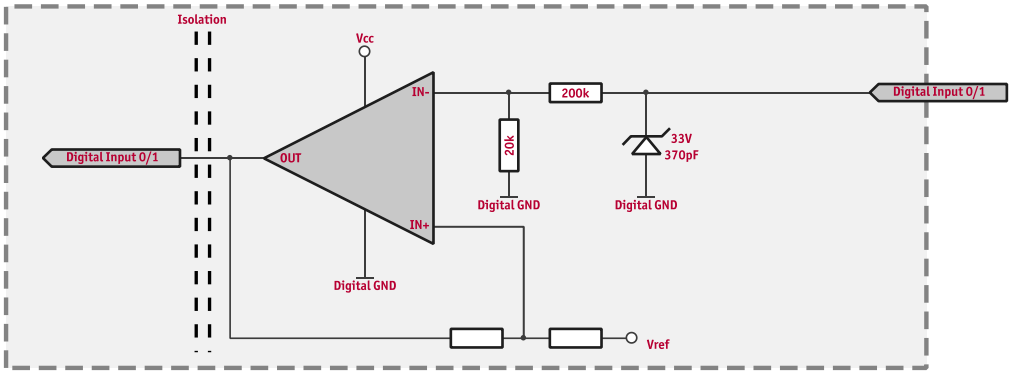


Figure 15: Digital input 0/1

Internal interconnection of digital output

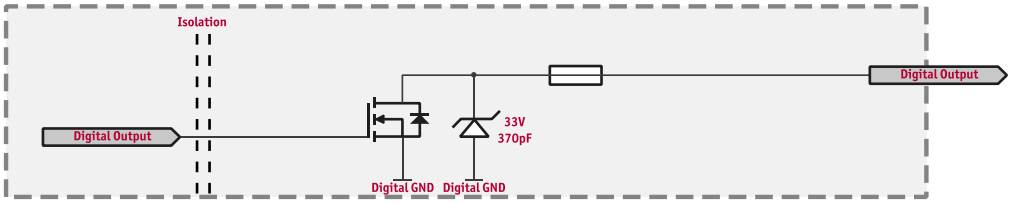


Figure 16: Digital output

Internal interconnection of analog input

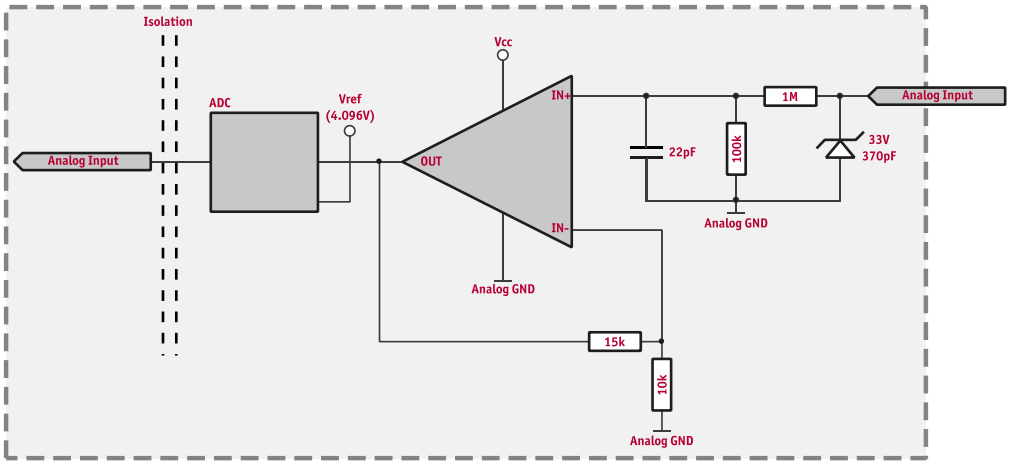


Figure 17: Analog input

Extended measuring range of the analog input

In normal operation, voltages up to 18 V can be applied and measured at the analog input. The cutoff frequency f_c (-3 dB) for AC voltages is approx. 7.2 kHz.

For measurements above 18 V (max. 50 V), an external series resistor has to be applied to the analog input. The series resistor R_{ext} depends on the input voltage U_{input} and can be calculated as follows:

$$R_{ext}[k\Omega] = \left[\left(U_{input} * 0.61111\right) - 11\right] * 100$$

with $18\,V < U_{input} \leq 50\,V$

The cutoff frequency for AC voltages is also affected by the external series resistor:

$$f_c[Hz] = \frac{1}{2.33 * 10^{-6} * R_{ext}[k\Omega]}$$

Examples

	24 V	32 V	36 V	48 V
R_{ext}	367 kΩ	856 kΩ	1100 kΩ	1833 kΩ
R_{ext} (E96)	374 kΩ (24.12 V)	866 kΩ (32.17 V)	1100 kΩ (36.00 V)	1870 kΩ (48.60 V)
f_c (-3 dB)	1148 Hz	496 Hz	390 Hz	230 Hz

2.6.7 Replacing Piggybacks

Warning: When performing this operation be sure not to touch the top or bottom of the boards (VN1630 main board or Piggybacks) to avoid damages due to electrical discharges.

1. First, loosen the VN1630 housing screws on the side with the two D-SUB9 connectors. This requires removing the two black decorative caps. Then carefully pull the PC-board out of the housing.

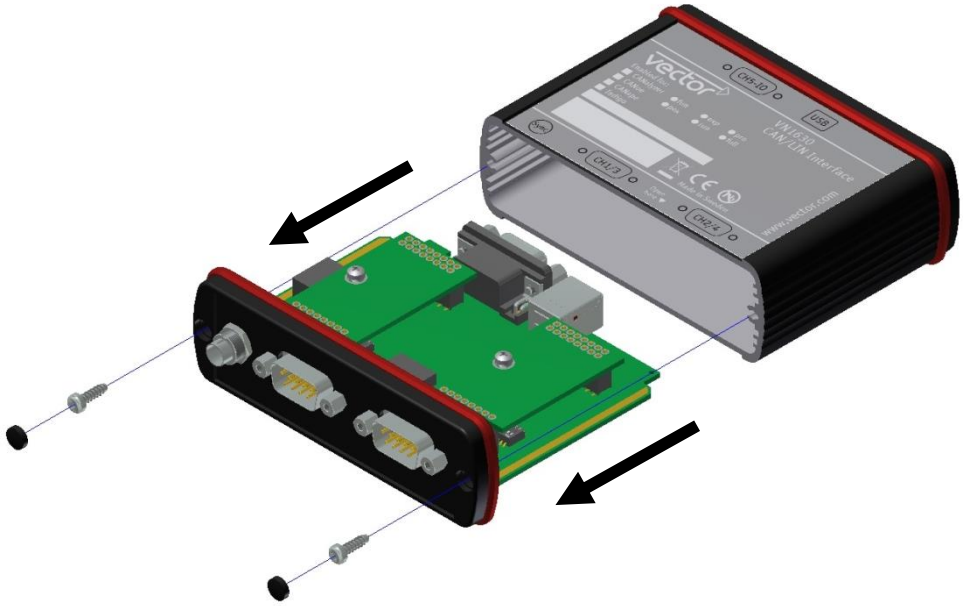


Figure 18: Opening the housing

2. You will find the plug-in location 1 (CH1) at the sync connector side and plug-in location 2 (CH2) at the edge of the PC-board.

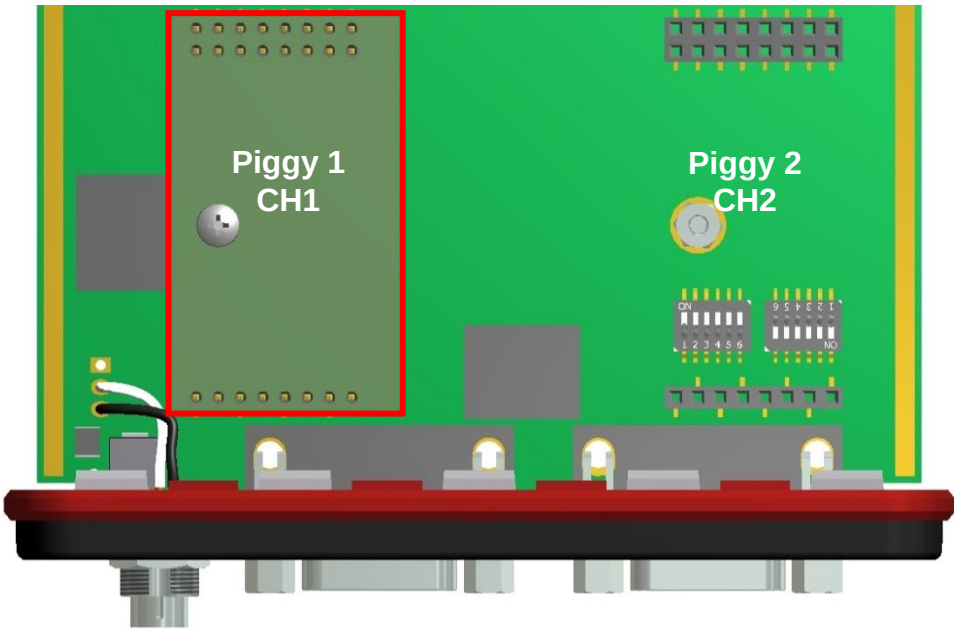


Figure 19: Piggyback plug-in locations CH1 and CH2

3. Each of the two Piggybacks is fastened by a screw and retainer. Please loosen the appropriate screw including the retainer and carefully remove the Piggyback from the plug-in location.

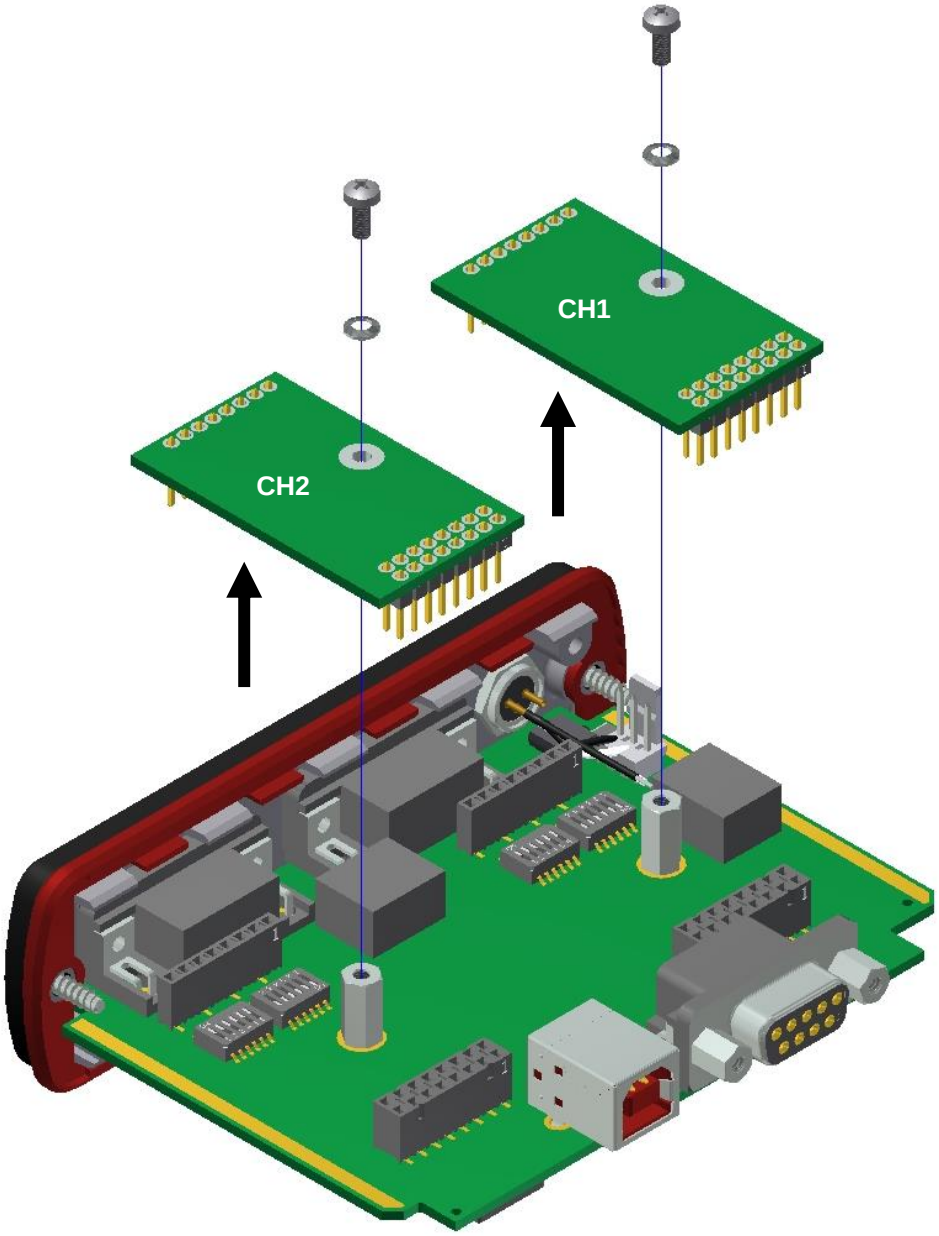


Figure 20: Unmount/mount Piggybacks

4. Set the DIP switches as described in section Pin Assignment CH1/3 and CH2/4 on page 20.
5. Insert the replacement Piggyback. When doing this please make sure that the single and dual-row connectors are not laterally offset.
6. Secure the new Piggyback with the appropriate screw and retainer.

7. Place the VN1630 main board back in the housing. This operation involves placing the housing on a table with its back side (side with the bar code) facing upward. Then the main board with the Piggybacks facing upward is inserted into the second guide rails.

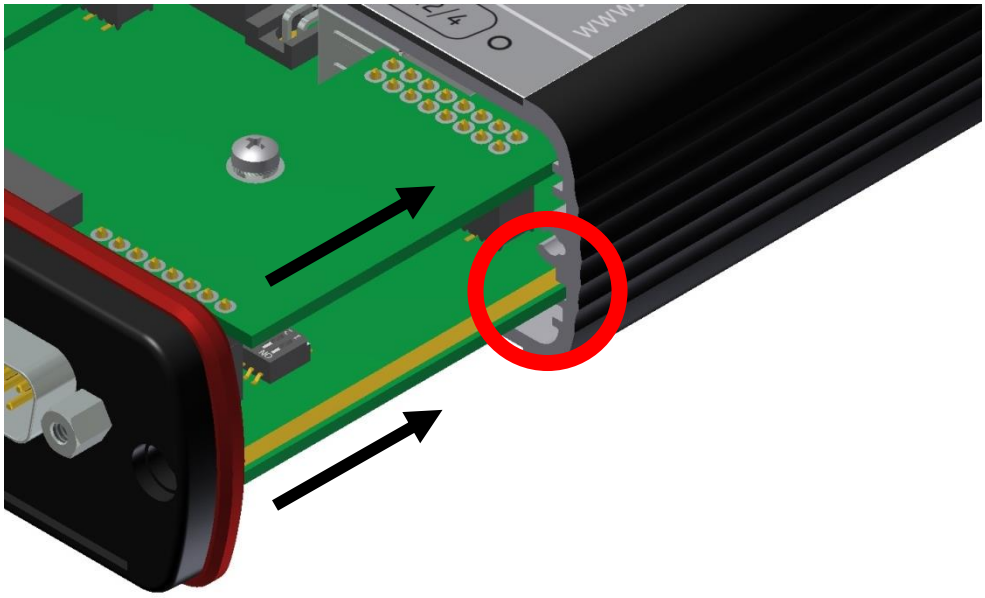


Figure 21: Second guide rails

8. It should be possible to slide the main board in the housing up to a few millimeters from the end without forcing it in. Close the housing by applying light pressure and then secure it with the appropriate screw fasteners. The screws should be secure but not excessively tight.
9. Please also attach the two black decorative caps.
10. Connect the VN1630 and the PC via the USB cable and check the bus configuration in **Vector Hardware Config**.

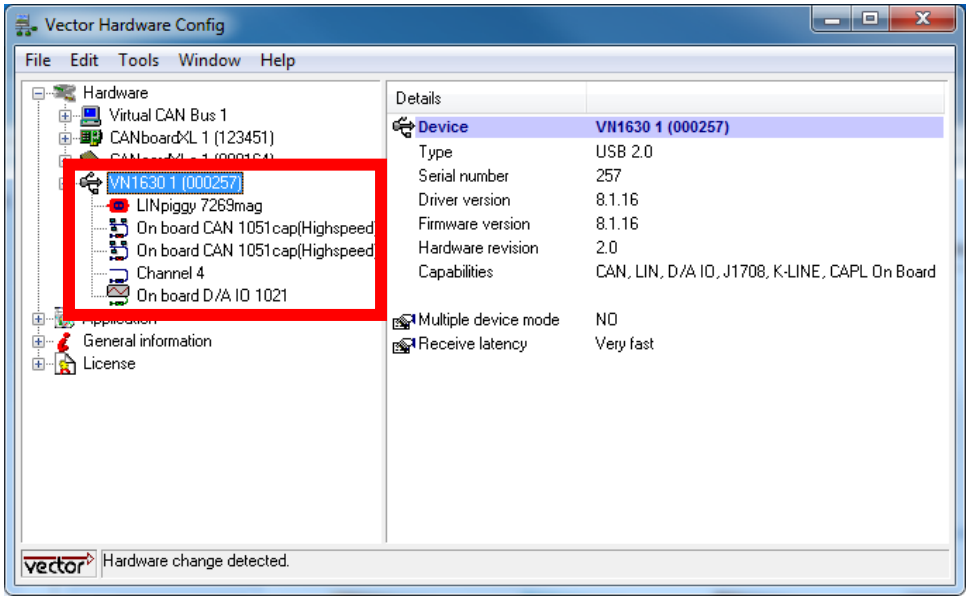


Figure 22: Check inserted Piggybacks

2.6.8 Technical Data

CAN channels	Max. 4, configurable via Piggybacks, up to 2 Mbit/s
LIN channels	Max. 2, configurable via Piggybacks, up to 330 kbit/s
K-Line channels	Max. 2 with LINpiggy 7269mag at CH1/CH2
J1708 channels	Max. 2, configurable via Piggybacks
Analog input	10 bit Input 0 V...18 V Voltage tolerance up to 50 V (with series resistor) Sampling rate up to 1 kHz
Digital input	Range 0 V...32 V Schmitt trigger high 2.7 V, low 2.2 V Hysteresis 0.5 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Current max. 500 mA Short circuit / over voltage protected
Temperature range	Operating: -40 °C...+70 °C Shipping and storage: -40 °C...+85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Operating system requirements	Windows 7 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit)
Dimensions (LxWxH)	Approx. 85 mm x 106 mm x 32 mm
Weight	230 g (without accessories)
Power consumption	Approx. 2.5 W

2.7 VN1630A

2.7.1 Main Features

VN1630A features

The main features and the technical data of the VN1630A are identical to VN1630. On top of that, the VN1630A has five LEDs indicating bus activities and status.

Figure 23: VN1630A CAN/LIN Interface

LEDs

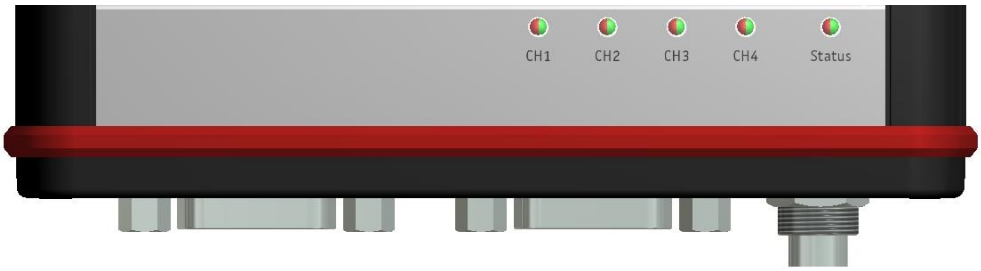


Figure 24: LEDs of the VN1630A

> **CH1 … CH4 (with CAN-/LINpiggies)**
> Multicolored channel LEDs, each indicating the bus activity for CAN or LIN.

Color	Description
Green	Data frames have been sent or received correctly. The flashing frequency varies according to the message rate.
Orange	Error frames have been sent or received. The flashing frequency varies according to the message rate.
Red	Bus off.

> **Status**
> Multicolored LED that indicates the status of the device.

Color	Description
Green	Device is ready for operation/running measurement.
Orange	Initializing driver. Please wait.
Red	Error. Device not working.

2.8 VN1640

2.8.1 Main Features

VN1640 features

The main features of the VN1640 interface are:

- 4x plug-in locations for CAN-/LINpiggies
- Fifth channel for dedicated digital-analog input/output tasks
- 5x D-SUB9 connectors
- Software sync
- Hardware sync (via SYNCcableXL)

Figure 25: VN1640 CAN/LIN Interface

2.8.2 Connectors Bus Side

Device connectors

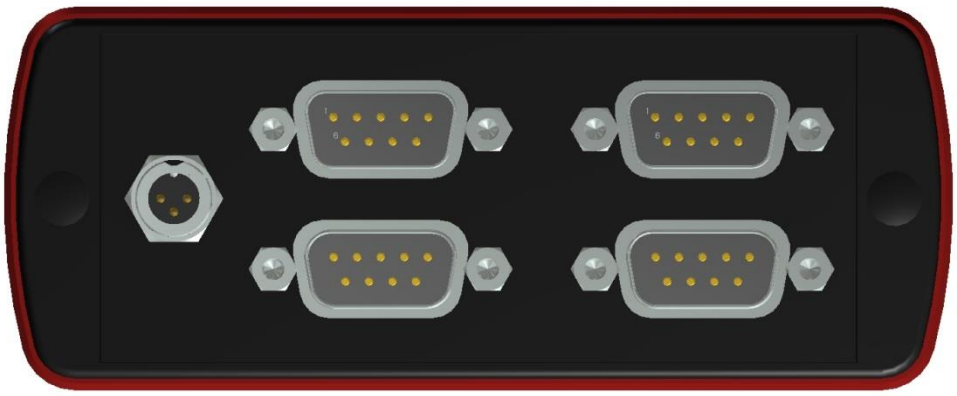


Figure 26: VN1640 with 1x Sync and 4x D-SUB9

- **Binder connector (Sync)**
  This connector (Binder type 711) can be used for time synchronization of different Vector devices. **The sync connector is not intended to connect a power supply.**

Pin	Assignment
1	Not connected
2	Synchronization line
3	Ground

> **D-SUB9 (CH1…CH4)**
The VN1640 has four D-SUB9 connectors, each assigned to a dedicated Piggyback plug-in location. Further information on the pin assignment can be found in section Pin Assignment CH1…CH4 on page 33.

2.8.3 Connectors USB Side

Device connectors

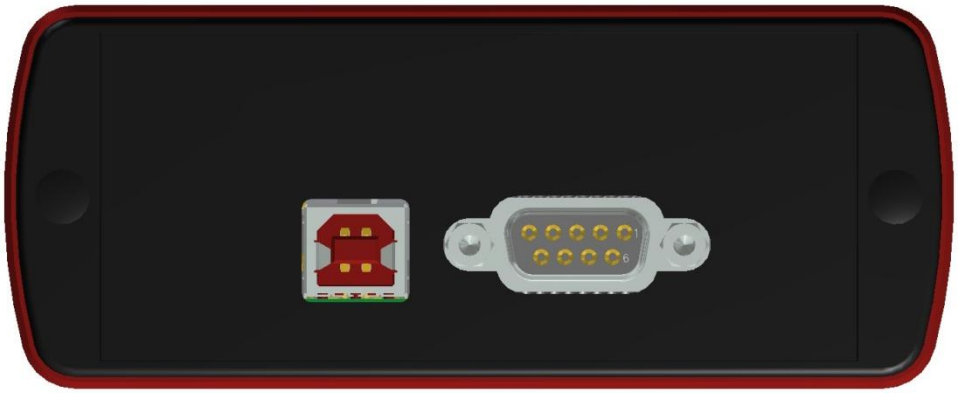


Figure 27: VN1640 with 1x USB and 1x D-SUB9

> **USB**
Connect your PC and the VN1640 via USB to install and to use the device with measurement applications (CANoe, CANalyzer). Use the USB2.0 compliant cable found in the delivery (USB extension cables may generate faults between the PC and the device). Connect the device directly to USB at your PC or use a USB hub with its own power supply (self-powered). Depending on the used Piggyback, the VN1640 requires the entire USB current (500 mA) which cannot be provided by a bus-powered USB hub.

> **D-SUB9 (CH5)**
The VN1640 has a D-SUB9 connector (CH5) for dedicated digital-analog input/output tasks. The pin assignment can be found in section Pin Assignment CH5 on page 34.

2.8.4 Bus Configuration

Piggybacks

An advantage of the VN1640 is its four Piggyback plug-in locations (CH1…CH4). Depending on requirements, **electrically** decoupled CAN High-Speed, CAN Low-Speed, CAN Single Wire, J1708 or LIN transceivers may be used. CH5 is reserved for dedicated IO tasks.

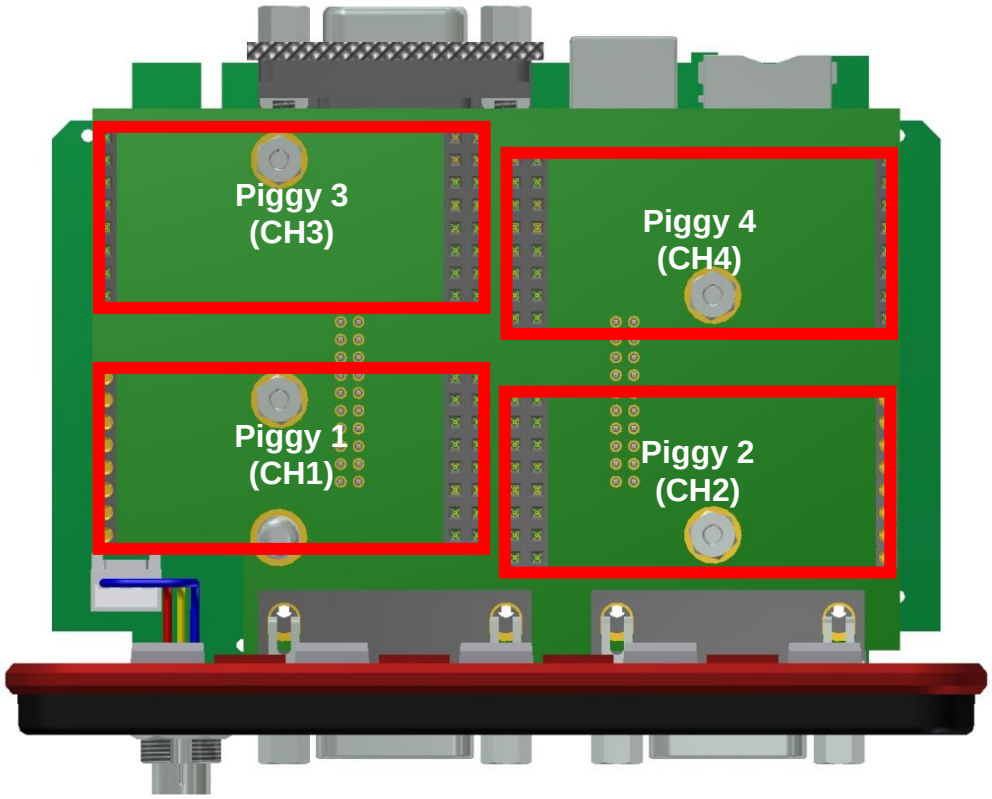


Figure 28: Piggyback plug-in locations for CH1…CH4

Note: LINpiggies have to be inserted before CANpiggies (in ascending order). If you intend to use only one LINpiggy, please use the first plug-in location (CH 1). J1708 should be handled like CAN here.

Piggyback Configurations			
CH1	**CH2**	**CH3**	**CH4**
CAN	CAN	CAN	CAN
LIN	CAN	CAN	CAN
LIN	LIN	CAN	CAN
LIN	LIN	LIN	CAN
LIN	LIN	LIN	LIN

Further examples

The following tables show examples of other combinations:

1x CAN

CH1	CH2	CH3	CH4
CAN	-	-	-

1x LIN

CH1	CH2	CH3	CH4
LIN	-	-	-

1x LIN
1x CAN

CH1	CH2	CH3	CH4
LIN	CAN	-	-

1x LIN
1x CAN

CH1	CH2	CH3	CH4
-	LIN	-	CAN

2x LIN
1x CAN

CH1	CH2	CH3	CH4
LIN	LIN	CAN	-

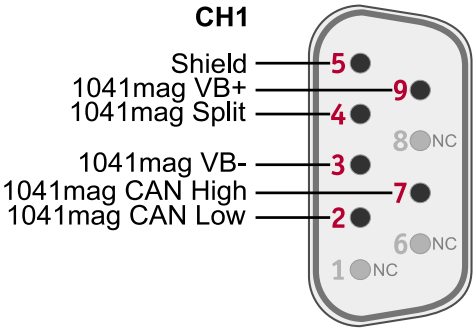
2.8.5 Pin Assignment CH1…CH4

Assignment of the D-SUB9 connectors

The pin assignments depend on the inserted Piggybacks. A list of available Piggybacks and their D-SUB9 pin assignments can be found in the separate accessories manual on the driver CD in `\Documentation\Accessories`.

Example: CANpiggy 1041mag

The following example shows the pin assignment of CH1 if a CANpiggy 1041mag is inserted in the plug-in location at channel 1:

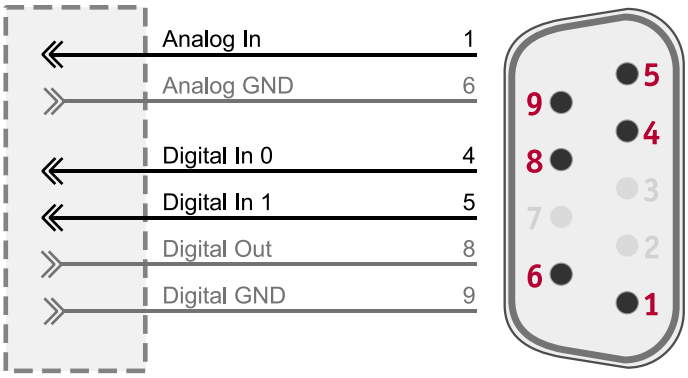


2.8.6 Pin Assignment CH5

Digital/analog IO

The pin assignment for CH5 is as follows:

(1) Analog input
(2) -
(3) -
(4) Digital input 0
(5) Digital input 1
(6) Analog GND
(7) -
(8) Digital output
(9) Digital GND



Internal interconnection of digital input 0/1

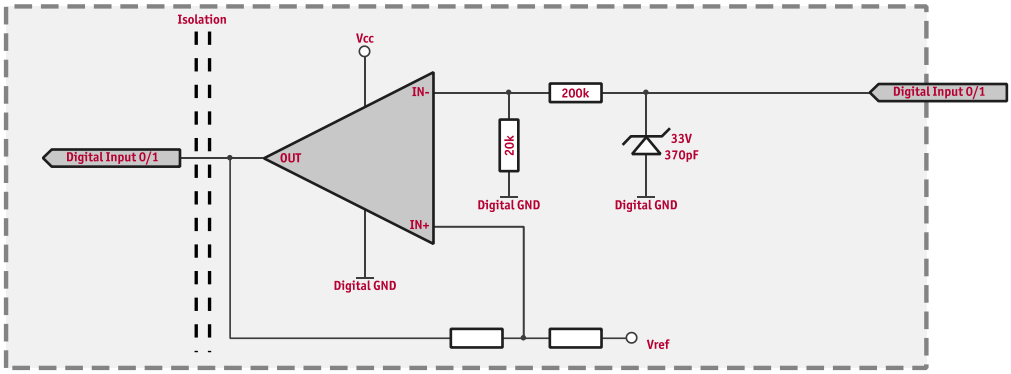


Figure 29: Digital input 0/1

Internal interconnection of digital output

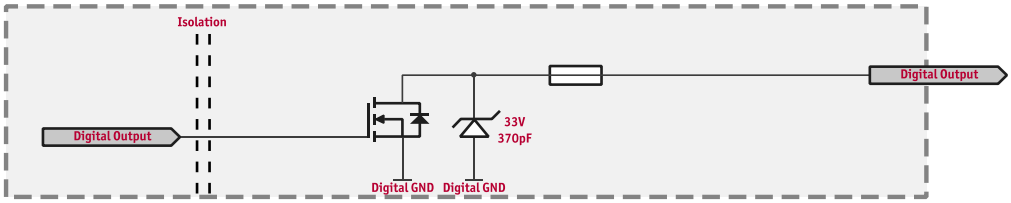


Figure 30: Digital output

Internal interconnection of analog input

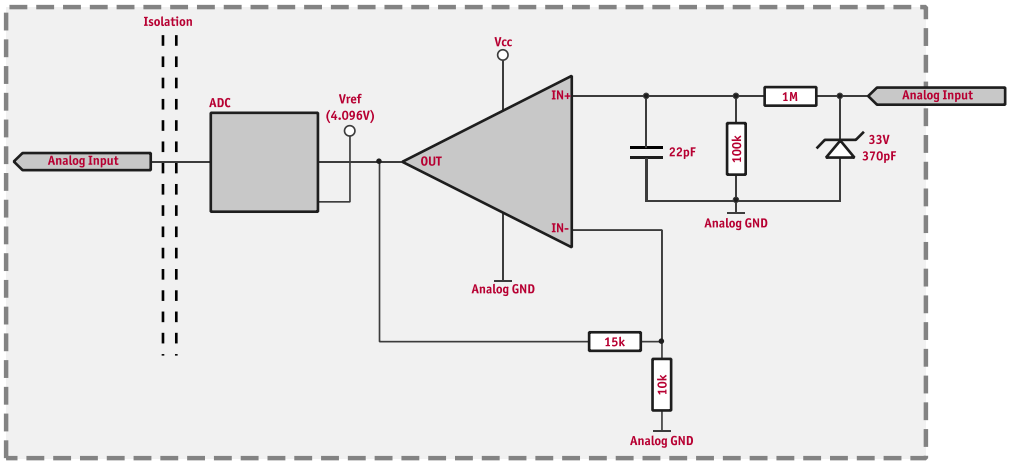


Figure 31: Analog input

Extended measuring range of the analog input

In normal operation, voltages up to 18 V can be applied and measured at the analog input. The cutoff frequency $\boldsymbol{f_c}$ (-3 dB) for AC voltages is approx. 7.2 kHz.

For measurements above 18 V (max. 50 V), an external series resistor has to be applied to the analog input. The series resistor $\boldsymbol{R_{ext}}$ depends on the input voltage $\boldsymbol{U_{input}}$ and can be calculated as follows:

$$\boldsymbol{R_{ext}}[k\Omega] = \left[\left(\boldsymbol{U_{input}} * 0.61111\right) - 11\right] * 100$$

with $18\,V < \boldsymbol{U_{input}} \leq 50\,V$

The cutoff frequency for AC voltages is also affected by the external series resistor:

$$\boldsymbol{f_c}[Hz] = \frac{1}{2.33 * 10^{-6} * \boldsymbol{R_{ext}}[k\Omega]}$$

Examples

	24 V	**32 V**	**36 V**	**48 V**
$\boldsymbol{R_{ext}}$	367 kΩ	856 kΩ	1100 kΩ	1833 kΩ
$\boldsymbol{R_{ext}}$ (E96)	374 kΩ (24.12 V)	866 kΩ (32.17 V)	1100 kΩ (36.00 V)	1870 kΩ (48.60 V)
$\boldsymbol{f_c}$ (-3 dB)	1148 Hz	496 Hz	390 Hz	230 Hz

2.8.7 Replacing Piggybacks

Warning: When performing this operation be sure not to touch the top or bottom of the boards (VN1640 main board or Piggybacks) to avoid damages due to electrical discharges.

1. First, loosen the VN1640 housing screws on the side with the four D-SUB9 connectors. This requires removing the two black decorative caps. Then carefully pull the PC-board out of the housing.

Figure 32: Opening the housing

2. The plug-in locations are defined as follows:

Figure 33: Piggyback plug-in locations CH1…CH4

3. Each of the two Piggybacks is fastened by a screw and retainer. Please loosen the appropriate screw including the retainer and carefully remove the Piggyback from the plug-in location.

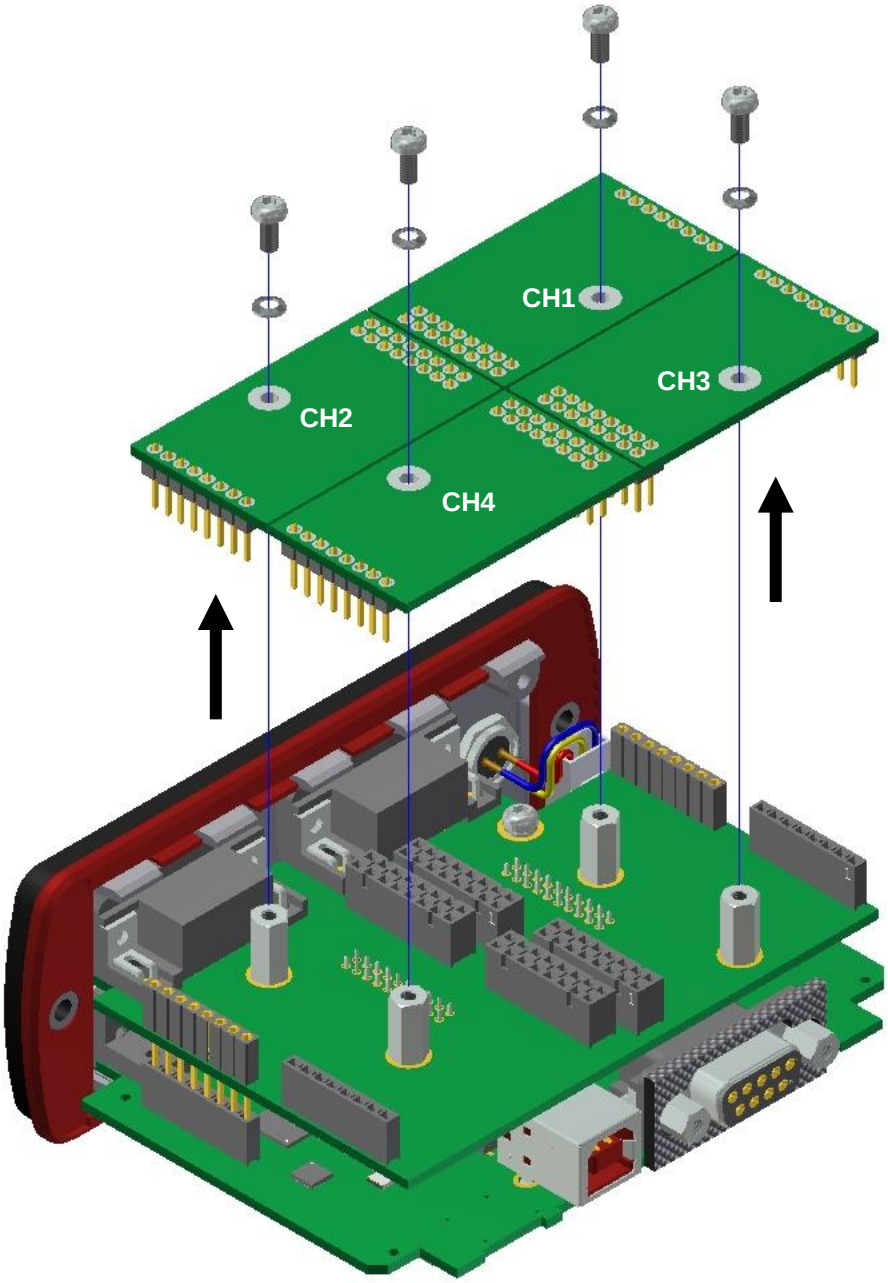


Figure 34: Unmount/mount Piggybacks

4. Insert the replacement Piggyback. When doing this please make sure that the single and dual-row connectors are not laterally offset.
5. Secure the new Piggyback with the appropriate screw and retainer.

6. Place the VN1640 main board back in the housing. This operation involves placing the housing on a table with its back side (side with the bar code) facing upward. Then the main board with the Piggybacks facing upward is inserted into the first guide rails.

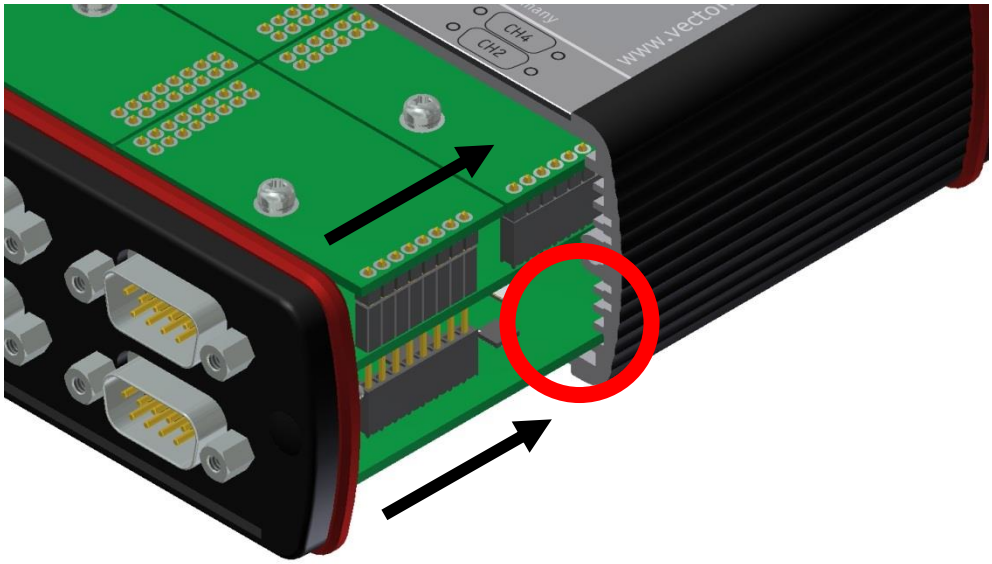


Figure 35: First guide rails

7. It should be possible to slide the main board in the housing up to a few millimeters from the end without forcing it in. Close the housing by applying light pressure and then secure it with the appropriate screw fasteners. The screws should be secure but not excessively tight.
8. Please also attach the two black decorative caps.
9. Connect the VN1640 and the PC via the USB cable and check the bus configuration in **Vector Hardware Config**.

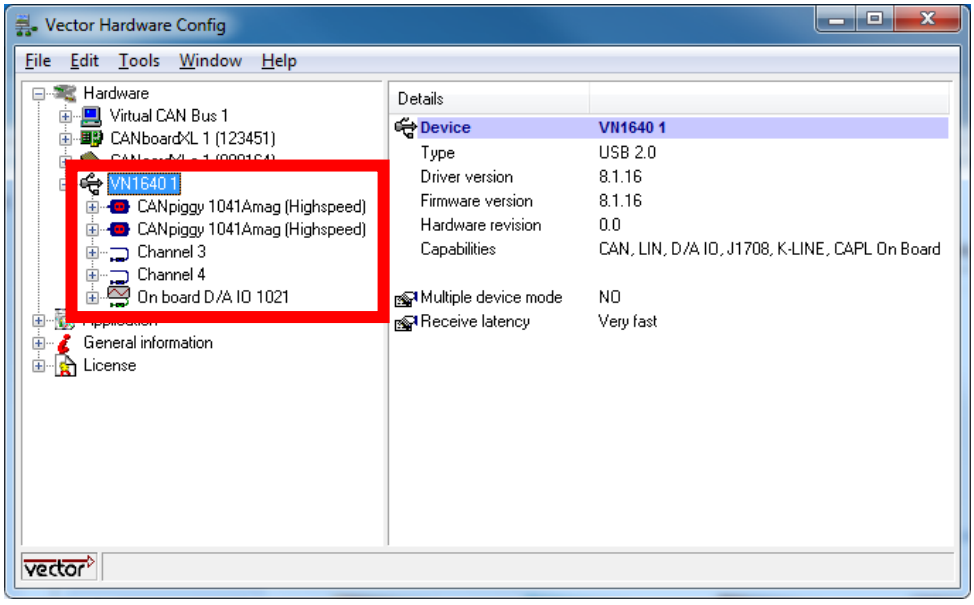


Figure 36: Check inserted Piggybacks

2.8.8 Technical Data

CAN channels	Max. 4, configurable via Piggybacks, up to 2 Mbit/s
LIN channels	Max. 4, configurable via Piggybacks, up to 330 kbit/s
K-Line channels	Max. 2 with LINpiggy 7269mag at CH1/CH2
J1708 channels	Max. 4, configurable via Piggybacks
Analog input	10 bit Input 0 V...18 V Voltage tolerance up to 50 V (with series resistor) Sampling rate up to 1 kHz
Digital input	Range 0 V...32 V Schmitt trigger high 2.7 V, low 2.2 V Hysteresis 0.5 V Input frequencies up to 1 kHz
Digital output	Open Drain External supply up to 32 V Current max. 500 mA Short circuit / over voltage protected
Temperature range	Operating: -40 °C...+70 °C Shipping and storage: -40 °C...+85 °C
Relative humidity of ambient air	15 %...95 %, non-condensing
Operating system requirements	Windows 7 (32 bit / 64 bit) Windows 8.1 (32 bit / 64 bit)
Dimensions (LxWxH)	Approx. 83 mm x 110 mm x 44 mm
Weight	330 g (without accessories)
Power consumption	Approx. 2.5 W

2.9 VN1640A

2.9.1 Main Features

VN1640A features

The main features and the technical data of the VN1640A are identical to VN1640. On top of that, the VN1640A has five LEDs indicating bus activities and status.

Figure 37: VN1640A CAN/LIN Interface

LEDs

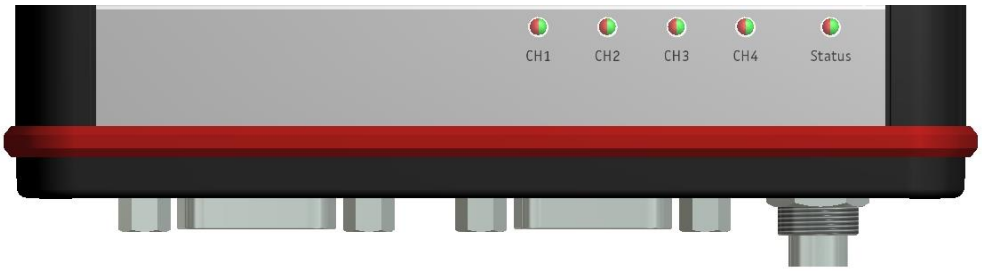


Figure 38: LEDs of the VN1640A

> **CH1 … CH4 (with CAN-/LINpiggies)**
> Multicolored channel LEDs, each indicating the bus activity for CAN or LIN.

Color	Description
Green	Data frames have been sent or received correctly. The flashing frequency varies according to the message rate.
Orange	Error frames have been sent or received. The flashing frequency varies according to the message rate.
Red	Bus off.

> **Status**
> Multicolored LED that indicates the status of the device.

Color	Description
Green	Device is ready for operation/running measurement.
Orange	Initializing driver. Please wait.
Red	Error. Device not working.

3 Common Features

In this chapter you find the following information:

3.1	Time Synchronization General Information Software Sync Hardware Sync	page 42

3.1 Time Synchronization

3.1.1 General Information

Time stamps and events

Time stamps are useful when analyzing incoming or outgoing data or event sequences on a specific bus.

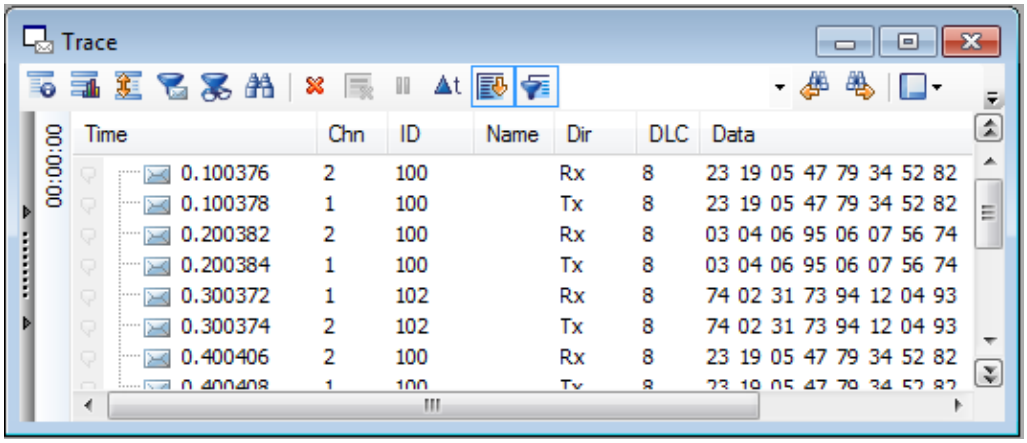


Figure 39: Time stamps of two CAN channels in CANalyzer

Generating time stamps

Each event which is sent or received by a Vector network interface has an accurate time stamp. Time stamps are generated for each channel in the Vector network interface. The base for these time stamps is a common hardware clock in the device.

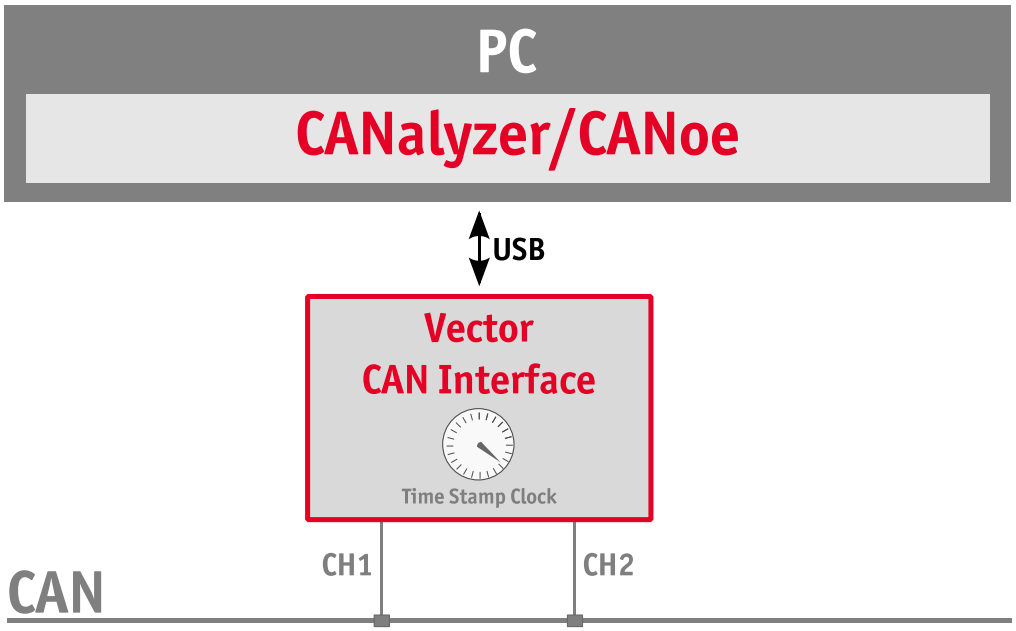


Figure 40: Common time stamp clock for each channel

If the measurement setup requires more than one Vector network interface, a synchronization of all connected interfaces and their hardware clocks is needed.

Due to manufacturing and temperature tolerances, the hardware clocks may vary in speed, so time stamps of various Vector devices drift over time.

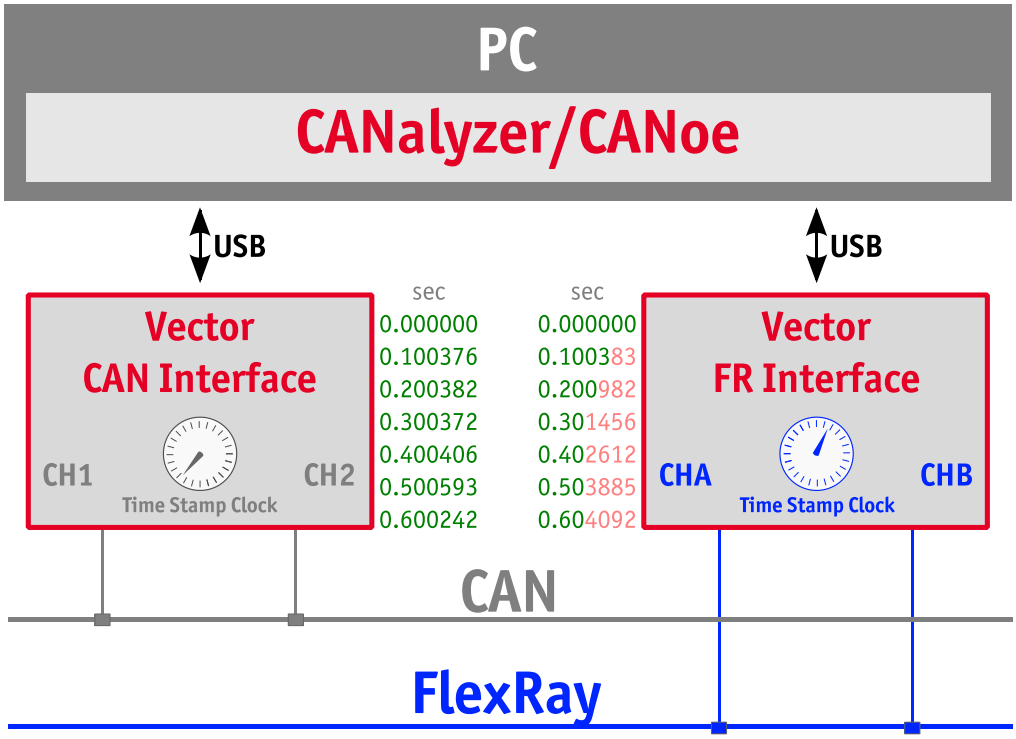


Figure 41: Example of unsynchronized network interfaces. Independent time stamps drift apart

To compensate for these time stamp deviations between the Vector network interfaces, the time stamps can be either synchronized by software or by hardware (see next section).

Note: The accuracy of the **software sync** is typically in range of **100 µs**.

Note: The accuracy of the **hardware sync** is typically in range of **1 µs**.

3.1.2 Software Sync

Synchronization by software

The software time synchronization is driver-based and available for all applications without any restrictions. The time stamp deviations from different Vector network interfaces are calculated and synchronized to the common PC clock. For this purpose no further hardware setup is required.

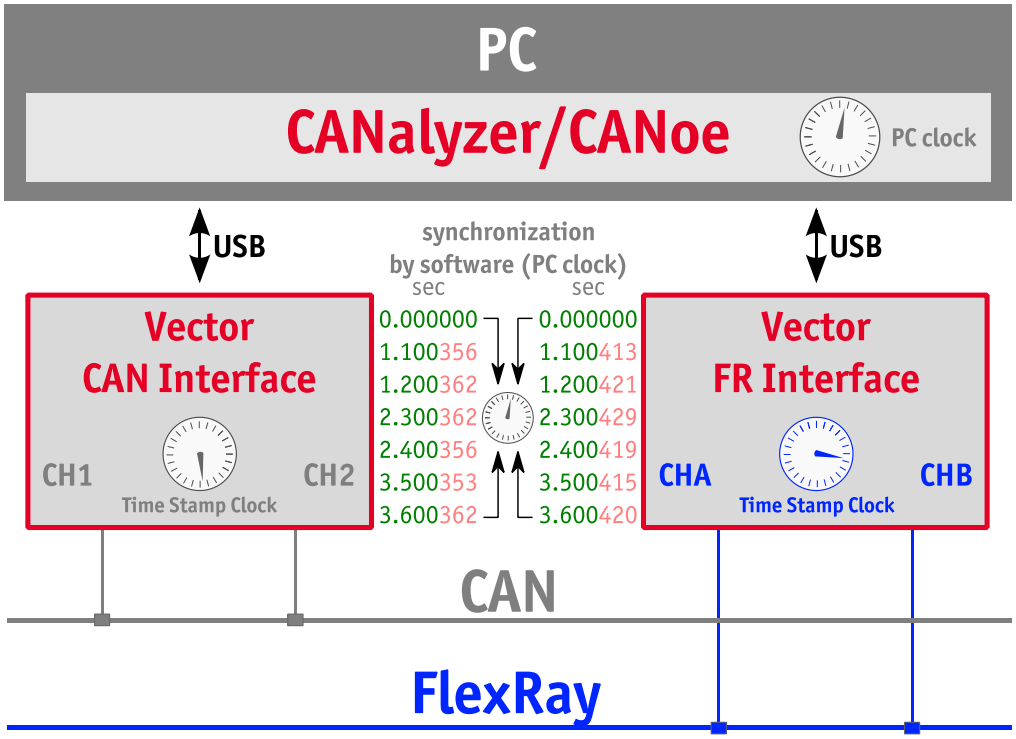


Figure 42: Time stamps of devices are synchronized to the PC clock (accuracy in range of 100 µs)

The setting of the software time synchronization can be changed in the **Vector Hardware Config** tool in **General information | Settings | Software time synchronization**.

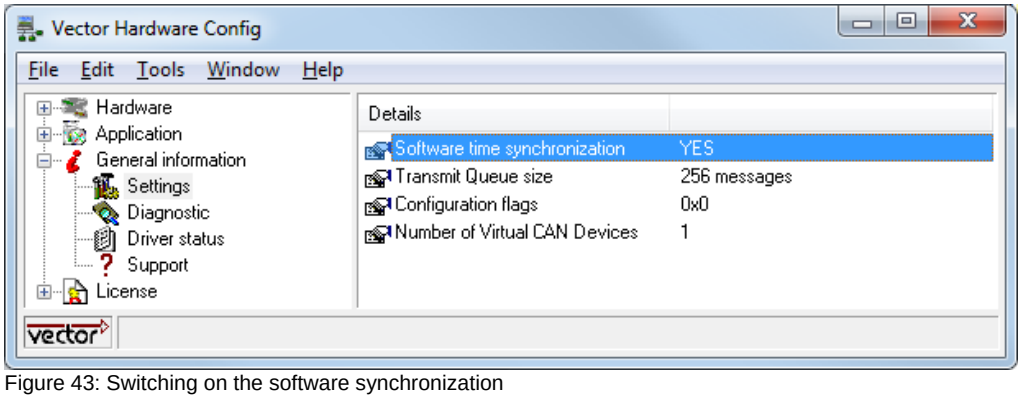


Figure 43: Switching on the software synchronization

> **YES**
The software time synchronization is active.

> **NO**
The software time synchronization is not active.
Use this setting only if the Vector network interfaces are being synchronized over the sync line or if only a single device is used.

3.1.3 Hardware Sync

Synchronization by hardware

A more accurate time synchronization of multiple devices is provided by the hardware synchronization which has to be supported by the application (e. g CANalyzer, CANoe). Two Vector network interfaces can therefore be connected with the SYNCcableXL (see accessories manual, part number 05018).

In order to synchronize up to five devices at the same time, a distribution box is available (see accessories manual, part number 05085).

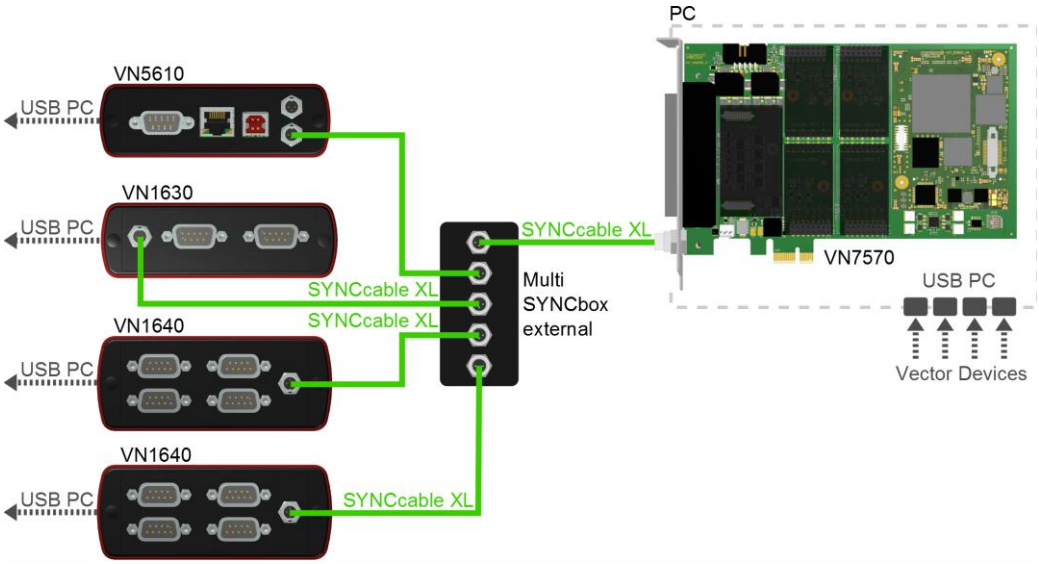


Figure 44: Example of a time synchronization with multiple devices

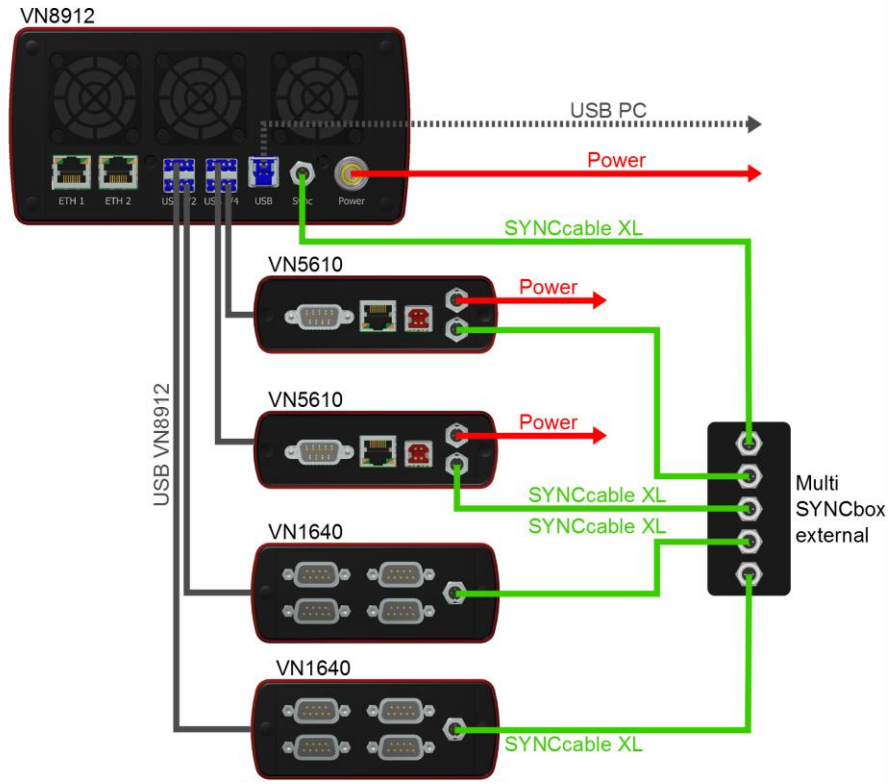


Figure 45: Example of a time synchronization with VN8912 and additional devices

At each falling edge on the sync line which is initiated by the application, the Vector network interface generates a time stamp that is provided to the application. This allows the application to calculate the deviations between the network interfaces and to synchronize the time stamps to a common time base (master clock) which is defined by the application.

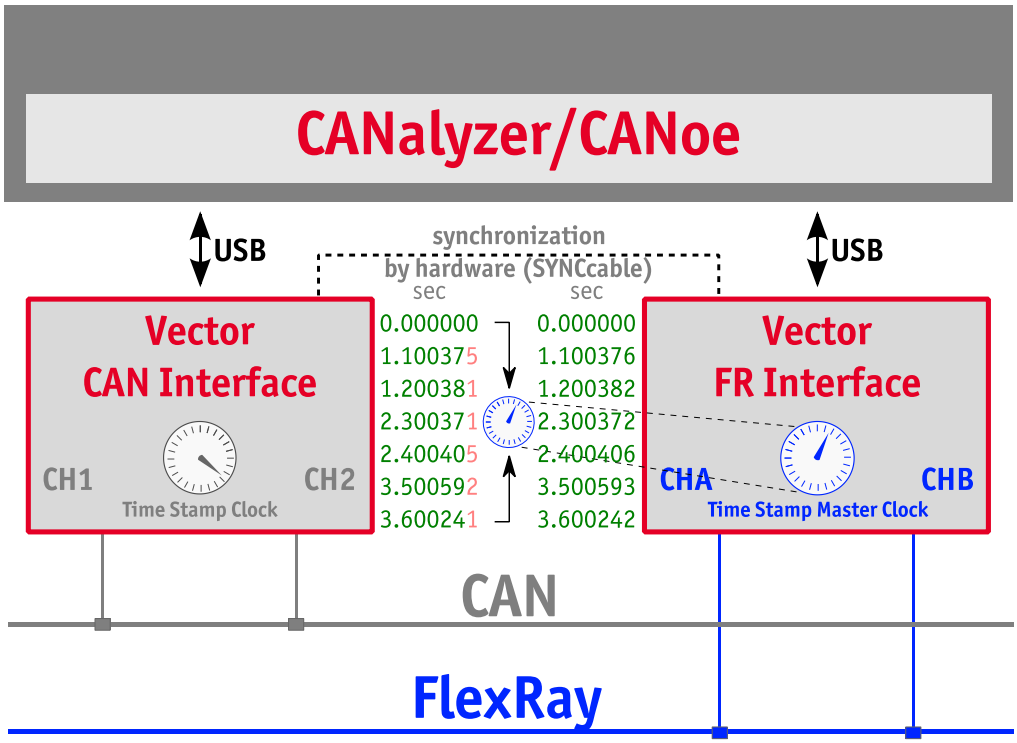


Figure 46: Time stamps are synchronized to the master clock (accuracy in range of 1 µs)

Note: The hardware synchronization must be supported by the application. For further information please refer to the relevant application manual. Please note that the software synchronization must be disabled (see **Vector Hardware Config | General information | Settings | Software time synchronization**) if the hardware synchronization is used.

4 Driver Installation

In this chapter you find the following information:

4.1	Minimum Requirements	page 48
4.2	Hints	page 49
4.3	Vector Driver Setup	page 50
4.4	Vector Hardware Configuration	page 52
4.5	Loop Tests CAN FlexRay MOST Ethernet	page 54

4.1 Minimum Requirements

Hardware

CPU	Pentium 4 or higher
Memory	512 MB or more
Network interface	CANcardXL : PCMCIA CANcardXLe : ExpressCard 54 CANboardXL PCI : PCI CANboardXL PCIe : PCI Express x1 CANboardXL pxi : Compact PCI/PXI CANcaseXL : USB CANcaseXL log : USB VN1610 : USB VN1611 : USB VN1630A : USB VN1640A : USB VN2610 : USB VN2640 : USB VN3300 : PCI VN3600 : USB VN5610 : USB VN7570 : PCI Express x1 VN7572 : PCI Express x1 VN7600 : USB VN7610 : USB VN8910A : USB VN8912 : USB

Software

Operating system	Windows 7 (32/64 bit) Windows 8.1 (32/64 bit)
Driver version	8.x
Measurement application	The devices can be run with several applications from Vector (e. g. CANoe, CANalyzer) or with measurement applications from other companies. The devices require a related license. Applications based on the Vector XL Driver Library can be run without a license.

4.2 Hints

Note: Many desktop PCs have power managers which block the CPU for a specific time. This impairs accuracy of the time system. If your application has stringent timing requirements (e. g. time-driven sending of messages or time-driven evaluations), you have to deactivate these power managers. Power management settings may be contained in the BIOS setup or on the Control Panel of Windows 7 / Windows 8.1 (e. g. Power options).

No further mention will be made of the power manager in this document.

Info: Please note that you will need **Administrator Rights** for the following steps.

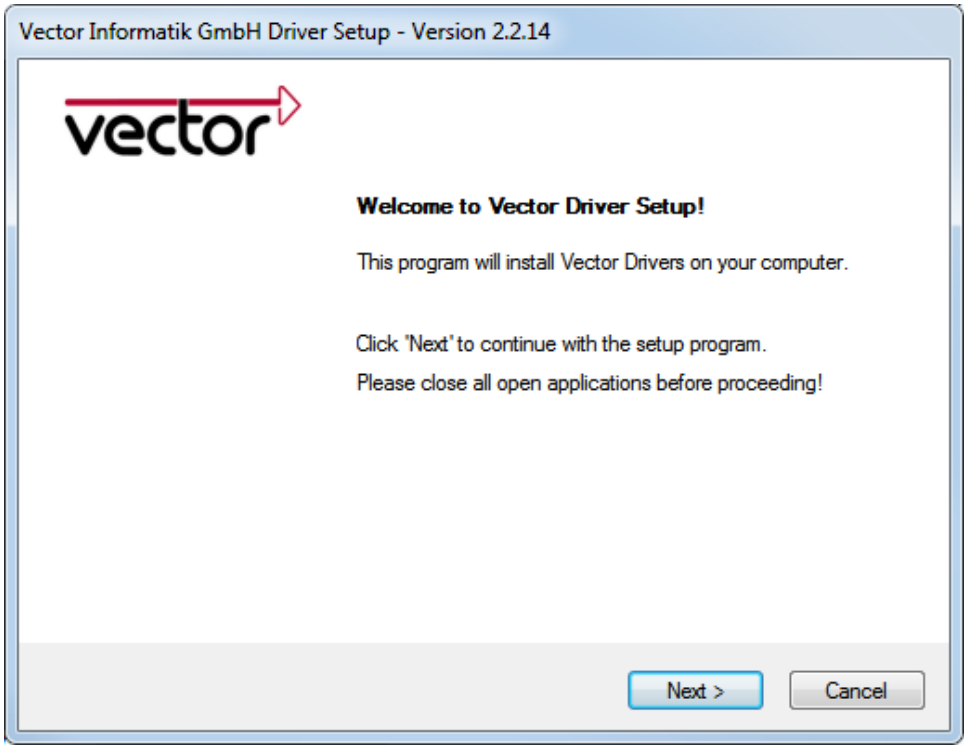
4.3 Vector Driver Setup

General information

The Vector Driver Disk offers a driver setup which allows the installation or the removal of Vector devices.

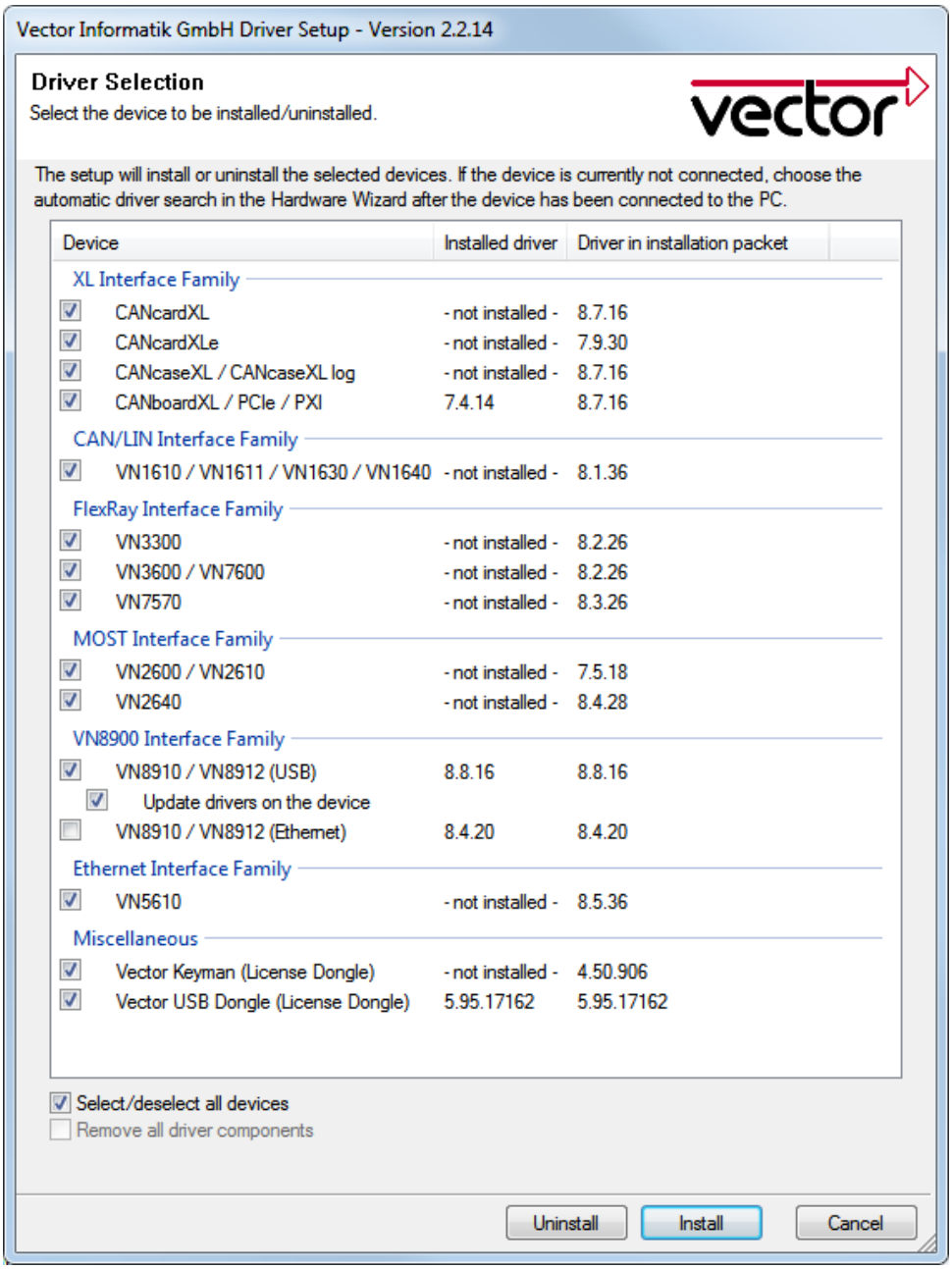
1. Execute the driver setup from the autostart menu or directly from `\Drivers\Setup.exe` before the device is inserted or connected to the PC with the included USB cable.

   If you have already inserted or connected the device to the PC, the **Windows found new Hardware** wizard appears. Close this wizard and then execute the driver setup.


Vector Informatik GmbH Driver Setup - Version 2.2.14
vector
Welcome to Vector Driver Setup!
This program will install Vector Drivers on your computer.
Click 'Next' to continue with the setup program.
Please close all open applications before proceeding!
Next >
Cancel

2. Click **[Next]** in the driver setup dialog. The initialization process starts.

3. In the driver selection dialog select your devices to be installed (or to be uninstalled).


Vector Informatik GmbH Driver Setup - Version 2.2.14
Driver Selection
Select the device to be installed/uninstalled.
vector
The setup will install or uninstall the selected devices. If the device is currently not connected, choose the automatic driver search in the Hardware Wizard after the device has been connected to the PC.
Device
Installed driver
Driver in installation packet
XL Interface Family
CANcardXL - not installed - 8.7.16
CANcardXLe - not installed - 7.9.30
CANcaseXL / CANcaseXL log - not installed - 8.7.16
CANboardXL / PCIe / PXI 7.4.14 8.7.16
CAN/LIN Interface Family
VN1610 / VN1611 / VN1630 / VN1640 - not installed - 8.1.36
FlexRay Interface Family
VN3300 - not installed - 8.2.26
VN3600 / VN7600 - not installed - 8.2.26
VN7570 - not installed - 8.3.26
MOST Interface Family
VN2600 / VN2610 - not installed - 7.5.18
VN2640 - not installed - 8.4.28
VN8900 Interface Family
VN8910 / VN8912 (USB) 8.8.16 8.8.16
Update drivers on the device
VN8910 / VN8912 (Ethernet) 8.4.20 8.4.20
Ethernet Interface Family
VN5610 - not installed - 8.5.36
Miscellaneous
Vector Keyman (License Dongle) - not installed - 4.50.906
Vector USB Dongle (License Dongle) 5.95.17162 5.95.17162
Select/deselect all devices
Remove all driver components
Uninstall
Install
Cancel

4. Click **[Install]** to execute the driver installation, or **[Uninstall]** to remove existing drivers.

5. A confirmation dialog appears. Click **[Close]** to exit.
If the driver has been installed properly, the device can be inserted or connected to the PC with the included USB cable. The device is ready for operation now.

4.4 Vector Hardware Configuration

Executing Vector Hardware Config

After the successful installation you will find the configuration application **Vector Hardware** in the Control Panel (see below). The tool gives you information about the connected and installed Vector devices. There are also several settings that can be changed.

Control panel Windows 7

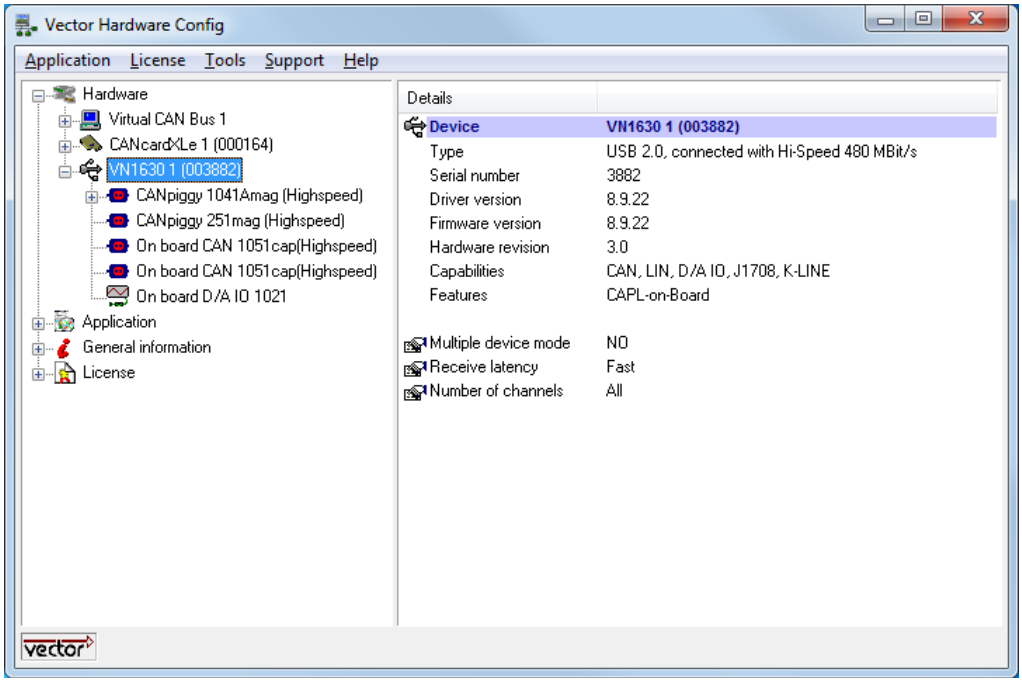
> Category view
Windows Start | Control Panel | Hardware and Sound, click **Vector Hardware** in the list.

> Symbols view
Windows Start | Control Panel, click **Vector Hardware** in the list.

Control panel Windows 8.1

> Category view
<Windows key>+<X> | Control Panel | Hardware and Sound, click **Vector Hardware** in the list.

> Symbols view
<Windows key>+<X> | Control Panel, click **Vector Hardware** in the list.



The tool is split into two windows. The left window lets you access the installed Vector devices, the right window displays the details of the selection. The following nodes are available in the left window:

Hardware

Each installed Vector device is shown in **Hardware**. Additional details of available channels are shown in a tree view. Status information on the device components and the channels are also shown in this dialog.

Application

In **Application**, all available applications are shown with their configured channels. If you click on an application, all of its channels are displayed in the right pane on the screen.

General information

The **General information** section contains general information on Vector devices and

applications.

License

The **License** section contains information on all current valid licenses.

Note: You will find a detailed description of **Vector Hardware Config** in the online help (**Help | Contents**).

4.5 Loop Tests

Operating test

The test described here can be performed to check the functional integrity of the driver and the device. This test is identical for Windows 7 / Windows 8.1 and independent of the used application.

4.5.1 CAN

Device test

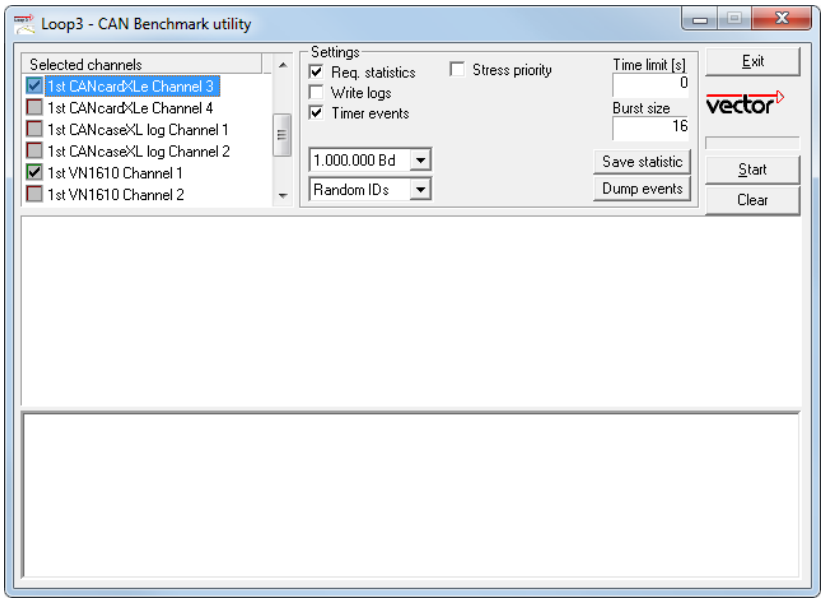
The operating test for CAN can be executed with the following devices:

- CANcardXL
- CANcardXLe
- CANcaseXL
- CANcaseXL log
- CANboardXL Family
- VN1610
- VN1630A
- VN1640A
- VN5610
- VN7570
- VN7572
- VN7600
- VN8910A
- VN8912

Loop3.exe

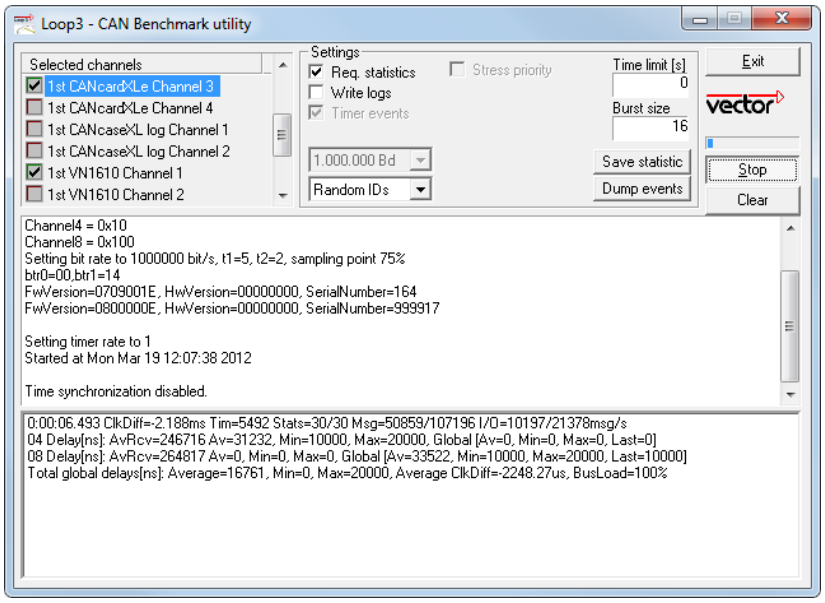
Either two High-Speed or two Low-Speed transceivers are necessary for this functional test:

1. Connect two CAN channels with a suitable cable. If two High-Speed transceivers are being used, we recommend our CANcable 1 (CANcable 0 for Low-Speed transceivers).
2. Start `\Drivers\Common\Loop3.exe` from the driver CD.
   This program accesses the Vector devices and transmits CAN messages.
3. Select the connected CAN channels of the device(s) to be tested.
4. Set the appropriate baudrate depending on the transceiver being used (High-Speed max. 1,000,000 Bd, Low-Speed max. 125,000 Bd).

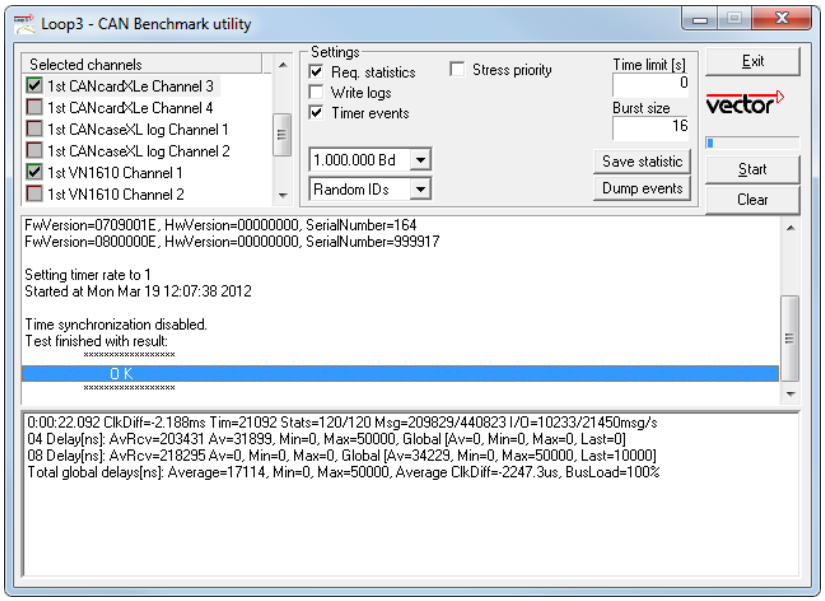


5. Click **[Start]**.
6. You will see statistical data in the lower part of the window if the system has been configured properly.

Loop3 application



7. The test procedure can be terminated with the **[Stop]** button.
   An **OK** should appear in the upper part of the window.



4.5.2 FlexRay

Device test

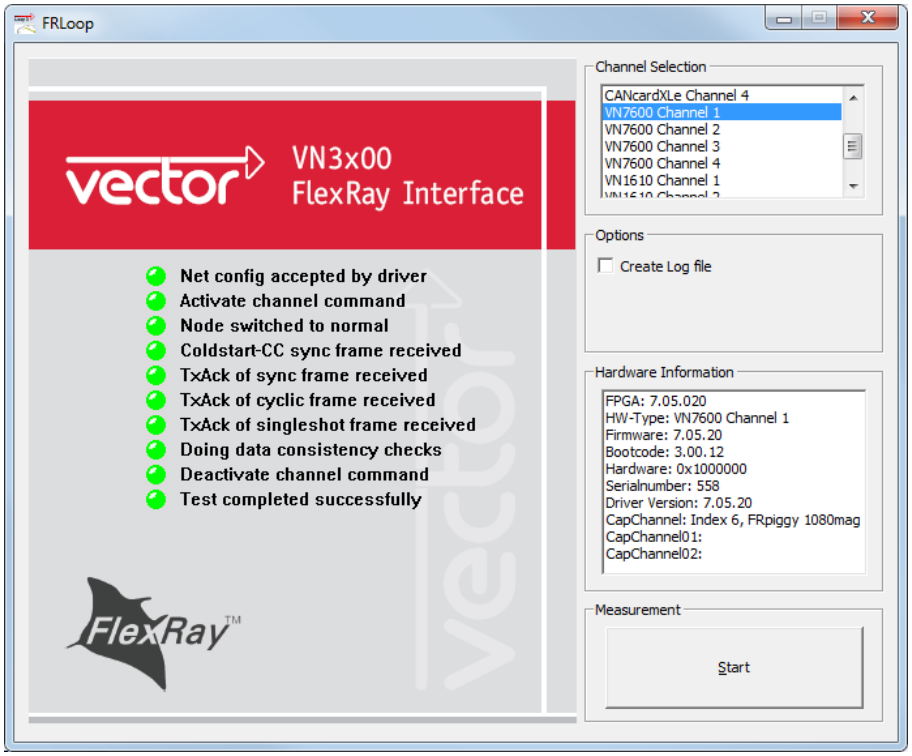
The operating test for FlexRay can be executed with the following devices:

- VN3300
- VN3600
- VN7570
- VN7572
- VN7600
- VN7610
- VN8910A with VN8970
- VN8912 with VN8970/VN8972

FRLoop.exe

This operating test requires an inserted FRpiggy.

1. Remove the FlexRay cable if it is connected.
2. Start `\Drivers\Common\FRLoop.exe` from the driver CD.
3. Execute the test.
4. If no error messages occur, the operating test was successful.



4.5.3 MOST

Device test

The operating test for MOST can be executed with the following devices:

> VN2610
> VN2640

MLoop.exe

This functional test requires a MOST fiber optic cable and a fiber coupler for HFBR connectors.

1. VN2610
   Start `\Drivers\Common\MLoop.exe` from the driver CD

   VN2640
   Start `\Drivers\Common\M150Loop.exe` from the driver CD.
2. Select the VN2610/VN2640 to be tested from the list of detected devices.
3. Click **[Twinkle]** and check if the power LED of the VN2610/VN2640 is blinking at least for one second.
4. Connect the MOST fiber optic cable with the VN2610/VN2640 device, select **Master** mode and check if the program displays the status **Unlock**. Check if red light comes out of the TX fiber of the MOST fiber optic cable.
5. Connect both ends of the fiber with one fiber coupler to a ring and check if the program displays the status **Lock**.
6. Close `MLoop.exe` with **[Exit]**.

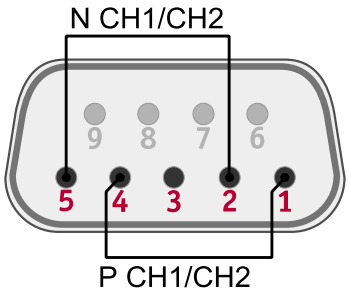
4.5.4 Ethernet

Device test

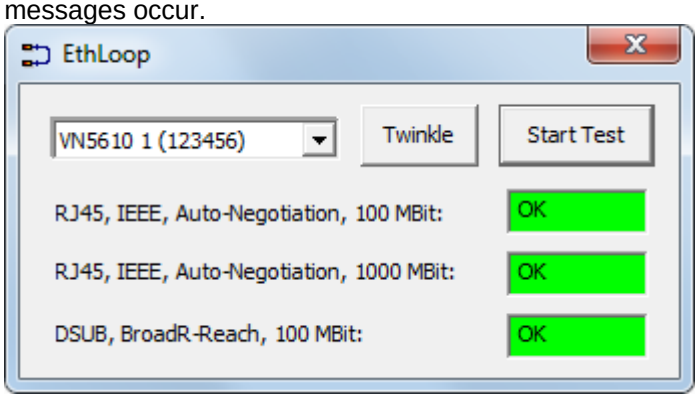
The operating test for Ethernet can be executed with the following devices:

> VN5610

1. Connect both Ethernet channels of the VN5610 with an Ethernet cable.
2. Connect both BroadR-Reach channels at the D-SUB9 connector as follows:



3. Start `\Drivers\Common\ETHloop.exe` from the driver CD.
4. Select an installed VN5610 from the list.
5. Press **[Twinkle]** and check if the LED **Status** blinks.
6. Start the test by pressing the button **[Start Test]**. The test is successful if no error messages occur.



Get more Information!

Visit our Website for:

> News

> Products

> Demo Software

> Support

> Training Classes

> Addresses

www.vector.com